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The Climates of New Zealand: According to Thornthwaite's Classification

B. J. GARNIER*

The climate of New Zealand has been described as insular or oceanic and has been classed as warm temperate. Such broad terminology fails to recognize the marked differences which actually exist between the climate of one region and another. There are local contrasts in rainfall totals, in rainfall periodicity, and temperature regimes which are particularly significant to successful land occupance, and some regional grouping of the various climatic types is clearly desirable.

New Zealand is situated between latitudes 34° 4′ S. and 47° 2′ S. Australia, the nearest large land mass, is nearly a thousand miles away, so that the country is surrounded by a vast expanse of sea. The land itself has been formed along a major north-east to south-west axis, although the Auckland peninsula represents a long arm which extends in a north-westerly direction. The total land area is about the same as that of Colorado. Six states in the United States are larger. In its widest part the land is only one fifth of the total length. Thus, the whole region is, broadly speaking, in the form of a curve with the concave side facing the west.

So small a land area as New Zealand has little effect upon the major circulation of the atmosphere in its vicinity. Its situation in the Pacific Ocean brings it under the influence of oceanic conditions, and its position in middle latitudes means that it is subject to the weather changes that are common in the temperate zone between the high pressure area of the subtropics and the low pressure region over the southern ocean.

* B. J. Garnier, M.A., is lecturer in geography and head of the department of geography at the University of Otago, Dunedin, New Zealand. This paper is presented under the sponsorship of Dr. C. Warren Thornthwaite.

Apart from areas of locally level land, such as the flat surfaces of the Canterbury plains, steep-sided hills, narrow gorge-like valleys and a rugged irregular skyline are typical of New Zealand landscapes. These landforms are the product of uplift during the late Tertiary (Kaikoura) earth movements and the wearing away, by sub-aerial denudation, of the resultant lofty crust blocks. Glacial scouring, volcanic activity and recurring earthquakes have assisted normal water and weather agents to produce the present topographical forms. From the climatic point of view, the high and irregular relief of the mountain ranges is the most noteworthy of the country's physical features.

The highest mountain ranges of New Zealand are found in the South Island, where the Southern Alps extend along the western side. They have their greatest elevation in the vicinity of Mount Cook (12,349 ft.), where several peaks exceed a height of ten thousand feet above sea level. The height decreases somewhat to south and north, but, except in the Sounds-Nelson area, the average elevation is in the nature of six thousand feet or more. The direction of the main ranges follows the structural south-west to north-east grain of the land. This means that the mountain ridges are lying across the direction of the chief rain-bearing winds and athwart the path followed by the majority of cyclonic disturbances. The tendency to a wet- and dry-side effect which is the consequence of this arrangement is emphasized by the steep and rugged nature of the land and the steep-sided intermontane depressions. In the southern part a number of ridges lie across the land in a south-east to north-west direction so that, in central Otago especially, there are several basins which are enclosed by sharp ridges into which rain-bearing winds rarely penetrate. In the north of the South Island the longitudinal ranges of the main mountain backbone and of the Kaikoura Mountains bound deep, narrow valleys, which bear a general north-east to south-west direction and which are climatically distinct for their dryness as compared to the surrounding districts.

A broadly similar topography is provided by the East Coast ranges of the North Island. These mountains are not so high as the Southern Alps and rarely exceed six thousand feet above sea level. Nevertheless, their situation across the path of westerly winds results in a dry-side effect on much of the eastern side, although it is not so well marked as in the South Island. Elsewhere in the North Island the chief effect of the relief features upon climate is to increase the rainfall and decrease the temperature locally. There are slight rain-shadow areas on the lee side of Mount Egmont (8250 ft.), in the Taihape area and to the northeast of Lake Taupo.

As a result of the nature and distribution of relief in New Zealand, climatic differences are found between localities on the lower parts of the

country. Practically all the land above approximately 2000 feet and below about 3500–4000 feet falls within one main climatic group. But on the lowlands a succession of climatic types is represented. Examples of cool, arid steppe country, of cool and warm grassland areas, and of humid and superhumid conditions are all found in various locations below two thousand feet. A classification of New Zealand climates, therefore, is even more necessary than if the only major contrasts in climatic character were between one high mountain area and another, or if they consisted of a broad division between lowland and highland.

METHOD OF CLASSIFICATION

A first attempt at a regional division of the climate of New Zealand was made on the basis of W. Köppen's system of classification, since his scheme has gained such wide recognition among geographers.[1]

Temperature and rainfall normals for fifty stations in New Zealand,* representing conditions in widely differing areas, were grouped according to his method. Of these fifty stations, only two were found to deviate from a Cfb climate. One of these, Alexandra in central Otago, was classed as BSk′ and the other, the Chateau Tongariro in the central North Island, was Cfc. One other station, Ophir, which is situated very close to Alexandra, was very nearly BSk′, while Waipiata, also in central Otago, verged strongly towards Cfs. Otherwise stations were Cfb.

Such results were somewhat unsatisfactory. If the Köppen system were used to classify the climate of New Zealand it would mean that, apart from the cold climates of high mountain areas, a small BSk′ area in central Otago, and Cfc areas locally in high-ground zones, a map would indicate all New Zealand as Cfb. Thus, the Hermitage on Mount Cook, Timaru in South Canterbury, and Waipoua in North Auckland would all be placed in one climatic province. Yet major differences between the climate of each area are readily apparent to people visiting them and may be discerned in the statistics presented in Table 1.

Since Köppen's scheme of classification could not be used to indicate clearly the differences between the climates of various parts of New Zealand, attention was turned to Thornthwaite's method. Six stations only were chosen for a preliminary survey, and it was at once apparent that here was

[1] I have not consulted Köppen in the original. The information which was used to classify stations referred to in the text was obtained from the tables and appendices in P. E. James, An Outline of Geography, New York, 1935, pp. 370 ssq.

* Grateful acknowledgment is made to the Director of Meteorological Services, Wellington, N. Z., for granting the author access to statistics and to Dr. C. J. Seelye for assistance in obtaining them.

TABLE 1

Climatic Statistics for Three Cfb Stations in New Zealand (see Fig. 4)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Hermitage (Mt. Cook), 2510 ft.													
Temp. (10 yrs.)	54.5	56.1	54.9	48.8	41.0	35.9	33.5	37.8	42.1	47.4	51.5	55.6	46.6
Rain. (26 yrs.)	19.43	12.17	15.21	17.46	12.51	11.99	8.29	11.39	12.38	16.71	12.99	10.88	161.41
Timaru, 56 ft.													
Temp. (32 yrs.)	60.6	60.3	57.4	53.3	46.9	42.6	41.4	43.9	47.8	52.9	55.6	58.9	51.8
Rain. (47 yrs.)	2.42	2.00	2.16	1.66	1.46	1.85	1.78	1.36	1.87	1.87	1.99	2.54	22.96
Waipoua, 225 ft.													
Temp. (15 yrs.)	63.1	63.9	62.4	60.3	54.5	51.7	49.3	50.6	52.2	54.9	58.4	61.5	56.9
Rain. (16 yrs.)	4.13	4.95	3.75	4.75	7.53	7.51	7.48	6.65	5.36	4.98	4.27	3.93	65.29

NOTE: The classification for these three stations under Thornthwaite's system is: Hermitage: AC′rb.
Timaru: CC′db.
Waipoua: AB′ra.

Temperatures shown in °F. Rainfall in inches.
Duration of record indicated in years.

a method which would point to contrasts in the character of the climate over the country. Thornthwaite's system, accordingly, was adopted.

The classification and system of calculation were the same as described by Thornthwaite in his paper of 1931.[2] P–E ratios and indices and T–E ratios and indices were established for as many stations as possible. Results were then grouped according to the values as given in Table 2.

TABLE 2

Summary of Thornthwaite's Climatic Regions

1. Where T–E indices are below 32 they determine the main groups:

Letter	*Type*	*T–E index*
D′	Taiga	16–31
E′	Tundra	1–15
F′	Perpetual frost and snow	0

2. Where T–E indices are above 32, P–E indices determine the main climatic groups:

Letter	*Type*	*Vegetation*	*P–E index*
A	Superhumid	Rain forest	128 & over
B	Humid	Forest	64–127
C	Subhumid	Grassland	32–63
D	Semiarid	Steppe	16–31
E	Arid	Desert	Under 16

3. Further subdivision of the groups contained in (2) above:

i. According to T–E indices:

Letter	*Type*	*T–E index*
A′	Macrothermal	128 & over
B′	Mesothermal	64–127
C′	Microthermal	32–63

ii. According to seasonal distribution of rainfall effectiveness:

Letter	*Group*
r	Moisture adequate at all seasons
s	Moisture deficient in summer
w	Moisture deficient in winter
d	Moisture deficient at all seasons

iii. According to seasonal distribution of thermal efficiency:

Letter	*Percentage summer concentration*
a	25–34
b	35–49
c	50–69
d	70–99
e	100

NOTE: No further subdivision of the climates in group 1 above is required.

A good deal of mathematics is involved in working out the various figures needed for the classification, and a nomogram based on the Thornthwaite's formula

[2] C. Warren Thornthwaite: The Climates of North America according to a new classification, *Geogr. Rev.*, Vol. 21 (1931), pp. 633–655.

$$\text{P–E ratio} = 11.5\left(\frac{P}{T-10}\right)^{10/9}$$

was used to establish P–E ratios.

P–E and T–E figures were obtained for those stations for which reliable temperature and rainfall normals are available, sixty-six in all. This number was not sufficient to establish proper regional boundaries. There are many locations for which rainfall normals, but not temperature normals, exist. In such cases, where a reasonable degree of accuracy could be assured, temperature estimates from known records were made, allowance being made for height at the rate of 2.74° F. for every thousand feet of elevation.[3] For areas where both temperature and rainfall figures were unobtainable or where temperature values were so unreliable as not to warrant the calculation of P–E ratios, an estimate of the P–E indices was made from approximate annual average temperatures and from annual rainfall totals.[4]

To obtain these approximate P–E index values the formula

$$\text{Approx. P–E index} = 10 \times 11.5\left(\frac{P}{T}\right)^{10/9}$$

was used, where P = estimated annual total precipitation and T = estimated annual average temperature. This value, which will be called X for the sake of brevity, approximates fairly closely to a true P–E index, at least under New Zealand conditions. It was tested against twenty known P–E indices for stations in widely different climatic zones in New Zealand. An indication of the degree of accuracy which can be expected may be obtained from Table 3 which compares P–E index values with X values for ten stations.

Where annual temperatures were used to classify the climate of a station, the temperature grouping was estimated according to whether the station had an estimated annual average value of over or under 52.6° F. Except in the high mountain areas, New Zealand temperatures may be classed as either B′ or C′. It was found by inspection of the known results that stations with an annual average temperature of 52.6° F. or under were all C′, whereas B′ stations were all over that figure. Hence this average value was chosen as an approximate method of distinguishing between the two regimes in the absence of more reliable information.

[3] This allowance for altitude is that made by the late Dr. E. Kidson. See E. Kidson: Mean temperature in New Zealand, *N. Z. Journ. Sci. and Tech.*, Vol. 13 (1931), pp. 140–153.

[4] Temperatures were obtained by reference to known values for various stations and to the maps in Kidson, *op. cit.* Rainfall figures were obtained from station records and by reference to E. Kidson: Average Annual Rainfall in New Zealand for the period 1891 to 1925. Wellington, 1930.

TABLE 3

A Comparison of P–E Indices and X Values for Ten Stations in New Zealand

Station (see Fig. 4)	Height (Ft.)	Av. temp.	Annual rainfall	P–E index	X value
Waipoua	225	56.9	65.29	131	134
Hamilton	131	55.7	46.59	92	94
Karioi	2125	48.4	48.05	114	114
Hastings	45	55.5	31.84	61	62
Pahiatua	384	53.9	51.35	108	109
Blenheim	30	54.6	24.04	48	46
Hokitika	12	52.6	114.32	265	272
Lake Tekapo	2350	47.0	22.53	52	51
Alexandra	520	50.4	13.11	25	26
Gore	234	49.6	34.81	76	78

THE CLIMATIC REGIONS

The climatic map (Fig. 1) reveals that within the small land area of New Zealand there is a remarkably complete climatic sequence. Superhumid, humid, subhumid, and semiarid climates are all represented, together with Thornthwaite's three classes of cold climate,—taiga, tundra, and regions of perpetual frost and snow. Taking into account minor subdivisions, a total of seventeen types may be recognized. From areas of perpetual frost and snow in the high mountain areas of both islands, it is possible to pass through various gradations of temperature and rainfall to an almost desert regime in central Otago. It is true that the greater part of the country falls within one of the rainfall groups A, B, or C, and that temperatures, outside the regions of cold climate, are either microthermal (C′) or mesothermal (B′). But within major groupings there are discernible differences in detail between one district and another. As a result, an intricate pattern of climatic types is revealed which typifies the regional variety of the country.

Broadly speaking there is a fundamental difference between the climates of the two main islands. The North Island may be distinguished as consisting of humid and superhumid, microthermal and mesothermal types. Together they occupy all but a fraction of the total area. In contrast to this is the climatic jigsaw of the South Island. All the major types represented in New Zealand are found there, and over short distances there is a remarkable degree of climatic change. Moreover, climatic contrasts between one district and another are particularly marked on the comparatively low-lying areas. While this is especially true of the South Island, where varieties of superhumid, humid, subhumid, and semiarid conditions are all present within a thousand feet of sea level, differences are also found between various parts of the lowlands of the North Island. These contrasts

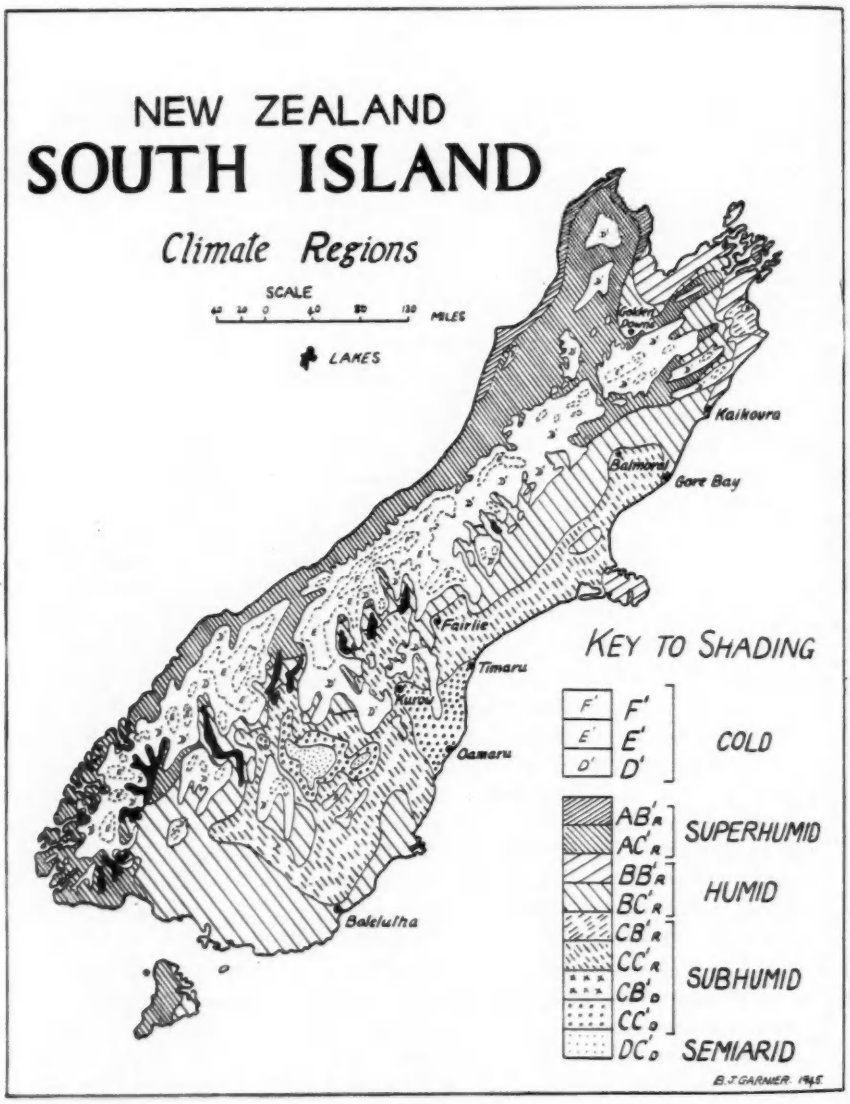
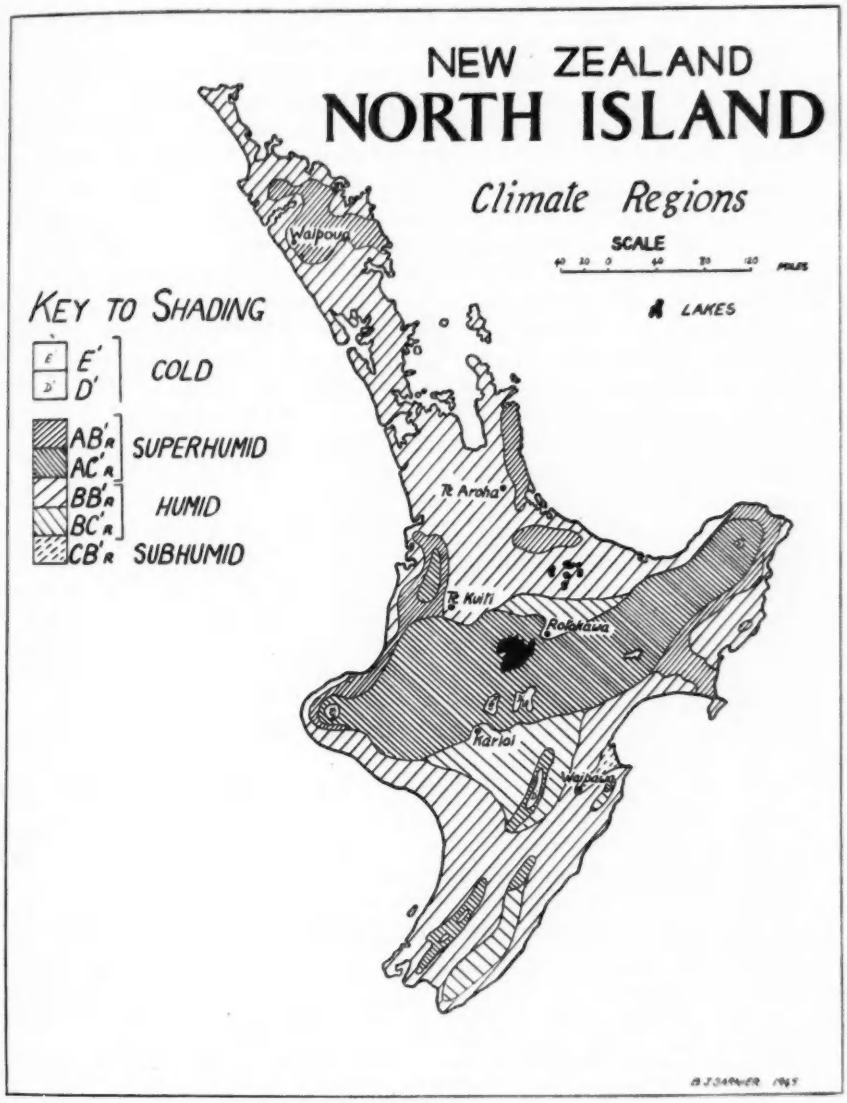

NEW ZEALAND
SOUTH ISLAND
Climate Regions
SCALE
MILES
LAKES
Kaikoura
Balmoral
Gore Bay
Fairlie
Timaru
Oamaru
Balclutha
KEY TO SHADING
F'
E'
D'
COLD
AB'R
AC'R
SUPERHUMID
BB'R
BC'R
HUMID
CB'R
CC'R
CB'D
CC'D
SUBHUMID
DC'D
SEMIARID
B. J. GARNIER. 1945

FIG. 1


NEW ZEALAND
NORTH ISLAND
Climate Regions
SCALE
LAKES
KEY TO SHADING
E'
D'
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AB'R
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SUPERHUMID
BB'R
BC'R
HUMID
CB'R
SUBHUMID
Walpoua
R. Aroha
R. Kuiti
Rotorua
Taupo
Wairoa

FIG. 1

in climatic type on the habitable lowlands of New Zealand form, perhaps, the most significant feature of the climate of the country.

In general, the climatic boundaries tend to follow the rainfall and relief divisions of the land. Nevertheless, Thornthwaite's allowance for temperature in relation to precipitation effectiveness means that the climatic boundaries cross the isohyets in places. The total rain required for a rainforest climate, for instance, is less in the cooler regions than in the warmer ones. One example of this is that in the central parts of the North Island a total rainfall of fifty inches a year is sufficient to produce superhumid conditions, whereas in the Waipoua district of North Auckland sixty-five inches of rain a year marks the boundary of a similar climatic zone.

Cold climates. Recorded statistics for high altitude stations are not available. It was necessary, therefore, to delimit the three categories of cold climate by the application of Kidson's lapse rate of 2.74° F. per 1000 feet of elevation to the statistics of known low altitude stations and by the use of a graph (Fig. 2) based on known results.[5] By these means it was possible to obtain the altitudinal limits of the three cold climate types, *viz.*, taiga, tundra, and regions of perpetual frost and snow.

The lower limit of the taiga (D′) climate was found to vary between just under 3000 feet in latitude 46° S. and 4600 feet in latitude 39° S. These results correlate satisfactorily with the observed limit of tall trees (*Nothofagus* species). In the South Island, for instance, the various species of *Nothofagus* appear to range up to about 3500 ft., according to latitude,[6] while V. D. Zotov[7] places the limit of tall trees in the Tararuas (latitude 41° S.) as 1200 meters (*c.* 4000 ft.) and quotes Cranwell and Moore as placing the limit on Mount Maungapohuta (East Cape, lat. 39° S.) as 1350 meters (*c.* 4500 ft.).

Tundra (E′) climate occurs at about 5000 feet in latitude 46° S. and at about 6500 feet in latitude 39° S. This also appears a satisfactory estimate; in the high country of the South Island tall tussock gives place to alpine formations at about 5000 feet[8] and in the Tararuas a corresponding boundary is in the region of 1800 meters (*c.* 6000 ft.).[9]

Regions of perpetual frost and snow occur above 7200 feet in the south-

[5] Grateful acknowledgment is made to Dr. C. W. Thornthwaite for devising the graph from data supplied.

[6] H. S. Gibbs, J. D. Raeside, and others: Soil Erosion in the High Country of the South Island, *N. Z. Dept. Sci. and Ind., Res. Bull.* No. 92 (1945), pp. 13–15.

[7] V. D. Zotov: Some Correlations between Vegetation and Climate in New Zealand, *N. Z. Journ. Sci. and Tech.*, Vol. 19 (1938), pp. 474–487.

[8] Gibbs & Raeside, etc.: *op. cit.*, pp. 13–15; F. W. Hilgendorf: The Grasslands of the South Island of New Zealand, *N. Z. Dept. Sci. and Ind. Res. Bull.* No. 47 (1935), p. 5.

[9] V. D. Zotov: *op. cit.*, p. 486 (diagram).

ern South Island and have a low limit of 8150 feet in latitude 39° S. These figures receive support from Kidson's estimate of the snowline varying from 7000 feet in the South Island to probably 8000 feet or little higher in the vicinity of Mount Egmont (8260 ft.) and Mount Ngauruhoe (7515 ft.).[10] The only permanent snowfield in the North Island is on the summit of Mount Ruapehu (9175 ft.), although it is very rare that snow is completely absent from the summit of Mount Egmont. Hilgendorf[11] places the line above which permanent snow occurs in the South Island as about 8000 feet.

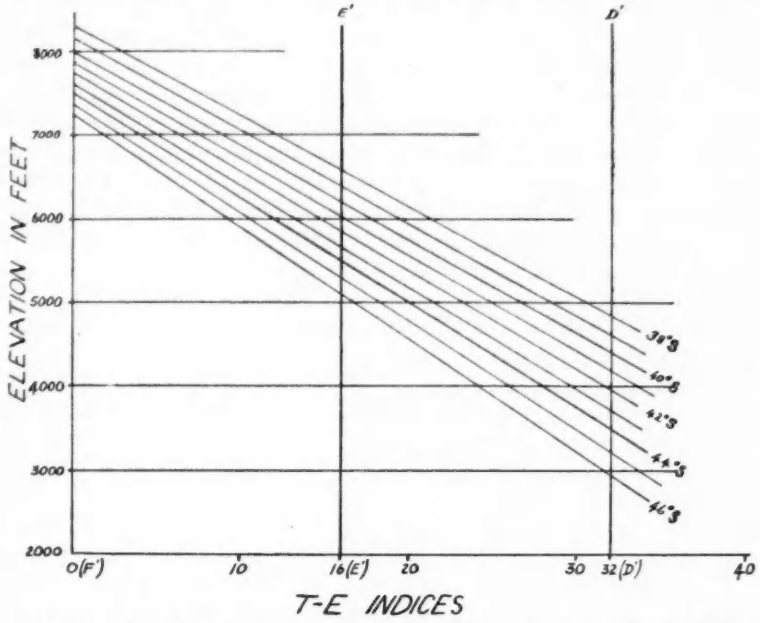

FIG. 2.—Graph to show the altitudinal limits of cold climates in different latitudes of New Zealand.

Apart from one or two small areas in the North Island, the cold climates of New Zealand are confined to the South Island. Two main areas of perpetual frost and snow are found; one in the vicinity of Mount Cook and the other in the high, glacial country to the west of Lake Wanaka.

Tundra (E') conditions flank the two areas of perpetual frost and snow and are also found widely scattered on the higher portions of the South Island mountain ranges.

[10] E. Kidson: Climate (of New Zealand). Chap. VII of Agricultural Organization in New Zealand, Belshaw, Williams and Stephens *et al.*, Melbourne, 1936.

[11] F. W. Hilgendorf, *op. cit.*, p. 5.

Taiga (D′) conditions occupy by far the greater part of the New Zealand cold-climate area. There are three main blocks. The first is in the mountain country of the south-west on the high gneissic and greywacke country which borders the fiord coast. A second occupies the main area of the Southern Alps, with a small eastward extension into the micaschist blocks which flank and divide the intermontane valleys of central Otago. A third zone exists in the land above 4000 feet on the ranges which form the north-east extension of the main highland masses. Apart from these three main taiga areas, there are several smaller zones where altitude justifies the delimitation of cold climate conditions; chief of these are the Kaikoura Mountains and the Permian blocks to the south and east of Lake Wakatipu.

Superhumid (A) climates. In the North Island the greatest extent of superhumid climate is found in the central highlands. The southern boundary extends from a point on the west coast, around the base of Mount Egmont and diagonally across country to East Cape. There is an extension of the climatic area to the seaboard north of Hawke Bay. For the most part this southern boundary conforms to the 60-inch isohyet. But the lowering of temperature in inland districts means that a rainfall of about fifty inches is sufficient to produce superhumid conditions (cf. Karioi, P–E index 114; rainfall 48 inches p.a.). At East Cape sixty-five inches marks the superhumid boundary.

On the northern side, the boundary line extends from Cape Runaway inland to the north-east of Lake Taupo and then irregularly around the wetter highland areas to the west coast. This boundary varies between sixty-five inches of rainfall near Cape Runaway, through forty-five inches near Lake Taupo, to sixty inches on the west coast.

Practically all the central North Island zone of superhumid climate is microthermal (AC′r), but narrow mesothermal (AB′r) belts exist on the eastern and western edges. It is probable that the interior regions have a tendency towards a high concentration of thermal efficiency in summer. The Chateau Tongariro, situated within the AC′ zone, and Taihape, Karioi, and Rotokawa, three interior stations, close to the superhumid boundary, are in areas where the summer concentration of thermal efficiency is between 35 and 49 per cent. In contrast to this, Stratford (elevation 1011 ft.), thirty miles inland from New Plymouth, and Onepoto (elevation 2110 ft.), on Lake Waikaremoana, both places within sixty miles of the sea, are each in temperature sub-group a, i.e., where the summer concentration of thermal efficiency is below 35 per cent.

North of the central highlands three patches of AB′r climate exist. X values in the locality of Rotoehu (P–E index 139; rainfall 63 inches p.a.)

point to a superhumid region there, outlined by the 60-inch isohyet. A narrow belt of rainforest climate occupies the eastern edge of the Coromandel peninsula and a broader region of the same climatic type is found on the higher land of the north Auckland peninsula, with an extension to the east coast. In each of these two areas existing and estimated climate data suggest that sixty-five inches of rain a year forms the superhumid boundary.

South of the central highlands AC′r conditions are found locally on the mountain ranges and mesothermal rainforest climate (AB′r) is absent.

In the South Island an unbroken belt of superhumid climate extends along the western side from north to south. It is broader in the north than in the south, where the mountain ranges confine it close to the coast. The western limit of the belt is the sea coast. Inland, the boundary is normally that of the taiga areas of the South Island mountain zone. In places rain forest conditions extend through the mountain mass to the boundary of the eastern humid zone. There are also patches of superhumid climate to the east of the mountain taiga. Where superhumid and humid climates meet, the boundary varies between the 60-inch isohyet in the north, 55-inch in the center and 50-inch in the south.

By far the greater part of the superhumid region of the South Island is microthermal. However, T–E indices of 66 and 64 respectively at two coastal stations, Westport and Kaihoka, suggest a narrow mesothermal belt along the northern west coast and there is a similar regime for the Marlborough Sounds superhumid zone. There is a tendency in the higher regions towards a greater summer concentration of thermal efficiency than in lower lying areas. The Hermitage on Mount Cook, as well as the stations at Lake Tekapo and Lake Coleridge, are all classed within temperature sub-group b.

Humid (B) climates. Humid conditions are found on all the comparatively low-lying regions of the North Island with the exception of a small area in the Napier-Hastings-Waipawa district. In spite of this general similarity of climatic type, however, there are considerable variations in detail. Northern stations are, on the whole, noticeably wetter than those to the south. Riverhead, for instance, a place a little to the north of Auckland, has a P–E index of 115. This is in marked contrast to the P–E index of 66 for Tangimoana on the Wellington coast plain.

The apparent differences between the climates of the north and south of the North Island suggest a possible division of the humid climates of this area into "wetter humid" and "drier humid" types. A useful division may be made by a line which extends from just east of Opunake in the Taranaki district, south of Karioi, and across to the coast of Hawke's Bay about twenty miles north of Napier. North of this line P–E indices are, with two

exceptions, all over 90.[12] The exceptions are the Gisborne area where, in a local valley zone, P–E indices are round about 70 and at Waipapakauri in the far north where the P–E index is 83.[13] South of the line the greater part of the land's climate has a P–E index which is less than 90. The tendency to drier conditions is most marked in a narrow coastal strip between Wanganui and Tangimoana in the west and on the land bordering the sub-humid zone between Waipawa and Napier on the east. Otherwise P–E indices of between 75 and 90 are usual.[14]

Differences in altitude and not in latitude are largely responsible for contrasts in the temperature grouping of the North Island humid areas. Land within about a thousand feet of sea level is nearly all mesothermal. On the higher ground, especially south of the central highlands, microthermal conditions prevail. As in the case of the superhumid climates, the interior regions are placed in temperature sub-group b, whereas other parts are a.

Humid conditions in the South Island are found in the north and northeast, on the eastern slopes of the main mountain ranges and in a broad area of the south. On the whole the drier-side boundary of the humid zone conforms to the 30-inch isohyet, except where highland taiga breaks into the relationship. In the north, though, higher temperatures than elsewhere in the South Island prevail, and thirty-five inches of rain a year differentiates humid from subhumid conditions. Just south of Cape Campbell, for instance, a calculation based on the annual average temperature for Blenheim and a total rainfall of thirty-five inches results in an X value of 69. At higher elevations, where it is cooler, a similar value is obtained from less rain (cf. Waihopai, elevation 800 ft. P–E index 69; av. annual rainfall 33 inches).

The boundary line between humid and subhumid regimes is regular along the foothills which flank the Canterbury lowlands; it is irregular farther south. In the latter area, B climates tend to occupy small districts between subhumid and taiga country. Farther south still, the boundary

[12] Thornthwaite divides the humid (B) climates into four parts using P–E index values of 80, 96, 112. See C. W. Thornthwaite: Atlas of Climatic Types in the United States 1900–1939, *U. S. Dept. of Agric. Misc. Pubn.* No. 421, Washington, 1941. None of these values fit North Island conditions so well as a P–E index of 90. A P–E value of 96 might be chosen as the basis of a two fold division, but discrepancies would occur at Auckland, Ruakura (Hamilton), and Opunake at each of which stations there is a P–E index value of 92.

[13] Records extending over four years only were available for Waipapakauri. The surrounding districts are consistently above P–E index or X values of 90.

[14] Exceptions to this position are in the Pahiatua-Woodville region, where P–E indices are over 100, and locally in highground areas. But rain shadow conditions are sufficiently marked near Taihape (2137 ft.) for the station to have a P–E index of 79.

has a less broken form and there differentiates the broad humid zone of Southland and the narrower area of eastern Otago from the subhumid regime of more inland regions. Two pockets of humid climate, one in the south and one close to Oxford near Christchurch, appear in the main subhumid zones.

On the whole South Island humid areas are microthermal. There is also a tendency for higher and inland parts to have a high summer concentration of thermal efficiency. The percentage concentration in summer at Gore, for example, is 36, at Queenstown it is 38 and at Golden Downs 36 per cent. Mesothermal conditions exist in the humid regions of the north and northeast. Banks peninsula, also a humid region, has a mesothermal temperature regime which links it with the northern parts of the South Island and much of the North Island.

Subhumid (C) climates. Only a very small area of subhumid climate exists in the North Island. It occupies a narrow belt of territory in the vicinity of Hawke Bay. The region extends from a point between Waipukurau and Waipawa to the coast on either side of Napier. The area thus enclosed is part of the Tuki Tuki river valley and the Heretaunga plains. It is not markedly subhumid. No P–E index here falls below 60, so that the region is only just within the requirements for a C classification. Rainfall is adequate at all seasons. Temperatures are mesothermal, but it is interesting to note that there is a greater summer concentration of thermal efficiency at Hastings than at Napier only a few miles away. Thus, Hastings (36 per cent summer concentration) is just within temperature sub-group b, whereas Napier (33 per cent summer concentration) is in sub-group a.

In contrast to the North Island, a large area of the South Island is subhumid. C climate extends throughout most of the Canterbury plains, the upland McKenzie basin, much of northern and central Otago and as far south as Balclutha. In addition to this main zone a small area near Blenheim is within the same classification.[15]

The subhumid region is narrow in the Canterbury area but broadens markedly farther south. In Otago and south Canterbury it extends from the coast up to the interior lakes between ridges of cooler, usually taiga (D′) climate, which fan out toward the south-east.

[15] It is likely that areas of subhumid climate exist in the deep, longitudinal intermontane valleys of the central and northern mountain zones of the South Island especially near Molesworth in the upper Awatere Valley. Evidence in support of this is to be found in the nature of the soil. (See Gibbs, Raeside, *et al.*, *op. cit.*, map on p. 12, showing climatic zones). Omarama series soils, which develop between 17 and 35 inches of rainfall, are found in some of these valleys. This does not prove subhumid climate, however, since the cool temperature conditions prevailing would bring about a humid regime under a comparatively low rainfall (see p. 163 of this paper).

A P–E index of 48 has been chosen by Thornthwaite as a divide between generally humid and generally arid climates. This classification places the area between Timaru and Oamaru and as far inland as Kurow as generally arid, and a similar term may be applied to a considerable portion of territory immediately outside the semiarid districts of central Otago. Parts of the northern Canterbury plain, particularly near Balmoral and between Christchurch and Lincoln, are very close to generally arid climates. A P–E index of 52 for Balmoral, and the same figure for Christchurch, is typical of conditions in these areas. Otherwise, in the Canterbury subhumid zone, the P–E index is higher. Although the McKenzie basin and the district around Lake Tekapo are regions of comparatively little rainfall, temperatures are sufficiently low to raise the area above the generally arid climates. At Lake Tekapo, for instance (the station is situated 2350 ft. above sea level) the total rainfall is practically the same as at Timaru (56 ft. above sea level).[16] The P–E index for the higher elevation is 52 compared with 45 at the lower station. A similar result is seen farther south in relation to the Manorburn Dam (2448 ft. above sea level). Here a P–E index of 50 is recorded for an annual average rainfall of 20.57 inches, which is just over two inches less than the rainfall at Timaru and is 1.3 inches less than that at Oamaru where the P–E index is 43. Where P–E indices are over 48 the rainfall is adequately distributed throughout the year, but where they are less it is deficient at all seasons.

All the Canterbury–Otago subhumid area is microthermal. On the whole, temperature ranges are large for New Zealand. One consequence of this is seen in a tendency towards a high summer concentration of thermal efficiency. This tendency is most apparent in the higher regions and is particularly marked in Otago, but many low-lying stations may also be classed in temperature sub-group b. The figures in Table 4 indicate that stations which are b are generally only just within that classification. At the Manorburn Dam, however, the percentage summer concentration of thermal efficiency is greater than is normal for districts for which statistics are available.

In addition to the main subhumid area of the South Island there is a small area of subhumid climate in the north east. Blenheim is the chief town of this area. The greater part of the district is CB′ra, but in the immediate vicinity of Blenheim, where the P–E index is 48, the classification is CB′da and the area should be related to the generally arid districts farther south.

Semiarid (D) climates. Semiarid conditions are absent in the North Island. They occur, however, in two areas of Otago in the South Island.

[16] Average annual rainfall figures are: Lake Tekapo, 22.53 ins.; Timaru, 22.96 ins.

The most important of these, and the one for which the most reliable statistics are available, is that around Alexandra, Clyde and Ophir. This is the BSk′ region of Köppen's classification, and Thornthwaite's formulae place it within his semiarid zone. Rainfall here is normally under sixteen inches a year, and there are considerable extremes of temperature. At Alexandra, for instance, total rainfall is 13.11 inches and the average temperature range is between 36.6° F. and 61.6° F.; at Ophir there are 15.44 inches of rain a year and the average temperature ranges from 34.2° F. to 60.2° F. Such conditions of rainfall and temperature yield P–E indices of 25 for Alexandra and of 31 for Ophir. This part of Otago is DC′db, and it represents the most arid conditions which prevail in any part of New Zealand.

TABLE 4

Percentage Concentration of Thermal Efficiency in Certain Localities in the Subhumid Areas of the South Island

Station	Height (ft.)	% T. eff.	Highest temp.	Lowest temp.
Lincoln	36	34.6	61.6	42.7
Waimate	200	32.9	59.6	42.0
Christchurch	22	35.1	61.4	42.3
L. Tekapo	2350	36.0	57.2	35.8
Waipiata	1550	39.5	58.2	35.9
Manorburn Dam	2448	45.5	54.0	30.3

NOTE: The first two stations are in temperature sub-group a, the others are in temperature sub-group b.

SOME CORRELATIONS WITH VEGETATION AND SOIL

A full discussion of the correlation between the climatic regions of New Zealand and the vegetation and soil types of the country would require a separate paper. Some general comments on the situation are, however, relevant here. Thornthwaite has repeatedly asserted the need for maintaining a close link between studies in climate, vegetation and soil. In a recent paper[17] he has suggested that a classification of climate might well begin with a study of soil and vegetation, in view of the close link between climatic types on the one hand and soil and vegetation zones on the other. Thus, a brief scrutiny of the position in New Zealand is desirable before this paper closes.

K. B. Cumberland[18] has mapped and described the leading features of

[17] C. Warren Thornthwaite: Problems in the Classification of Climates, *Geogr. Rev.*, Vol. 33 (1943), pp. 233–255.

[18] K. B. Cumberland: A Century's Change; Natural to Cultural Vegetation in New Zealand, *Geogr. Rev.*, Vol. 31 (1941), pp. 529–554.

the primitive vegetation of New Zealand. In his paper he is careful to point out that much of the indigenous forest in the country was destroyed before the arrival of the white man, possibly by such "natural factors as showers of volcanic ash and lava flows in the North Island and föehn bush fires in the South Island." It is the vegetation which existed before this destruction took place which is relevant to our immediate purpose.

It appears that forest was dominant in the North Island and that a similar vegetation covered the South Island except for certain east coast districts where a climax formation of grassland existed.[19]

The original forested character of the North Island conforms to the essentially humid and superhumid nature of the region. Moreover, the boundary between the kauritaraire forest of the northern part and the mixed podocarp-dicotylous forest of the central and southern portions bears a general similarity to the climatic divisions of the land. Kauritaraire forest occupied that part of the North Island which is climatically either AB′r or else BB′r ("wetter humid" area). Where the climate is AC′r or BC′r or BB′r (the latter of the "drier humid" type) the forest was predominantly mixed podocarp-dicotylous. Furthermore, in the Wellington-Wairarapa area, where the T–E indices on the mesothermal lowlands are consistently between 64 and 70 and where microthermal conditions prevail at comparatively low altitudes, beech appears as an important forest species.

This seems to suggest that an important climatic boundary in the North Island is formed by the limit of areas where P–E indices are over 90 and T–E indices are over 70. On the map (Fig. 3) is marked the southern limit of areas where the T–E index is 70 or more. Practically all the area north of this line has a P–E index of over 90. Exceptions to this are between Wanganui and Opunake in the west, the subhumid and nearby areas of Hawke's Bay, and the district around Gisborne. Further substance is given to the importance of the boundary by reference to the present distribution of grassland, especially the location of *Paspalum dilatatum*. The occurrence of *Paspalum* is, according to E. A. Madden,[20] "governed very

[19] V. D. Zotov, who has made the most complete recent study of the grasslands of the South Island, applies the term steppe to all the grasslands of the eastern South Island, although he admits that "the climate throughout the greater part of New Zealand is so much wetter than that of the typical steppe." He does not distinguish between the grassland of wetter and drier South Island areas. His major contrast is between grassland as a successional type, which he terms "induced steppe," and as a climax formation, which he terms "climax steppe." See V. D. Zotov: Tussock-Grasslands of the South Island, New Zealand: Preliminary Report, *N. Z. Journ. Sci. and Tech., Sect. A*, Vol. 20 (1938–1939), pp. 212a–244a.

[20] E. A. Madden: The Grasslands of the North Island, *N. Z. Dept. of Sci. and Ind., Res. Bull.*, No. 79 (1940), p. 22.

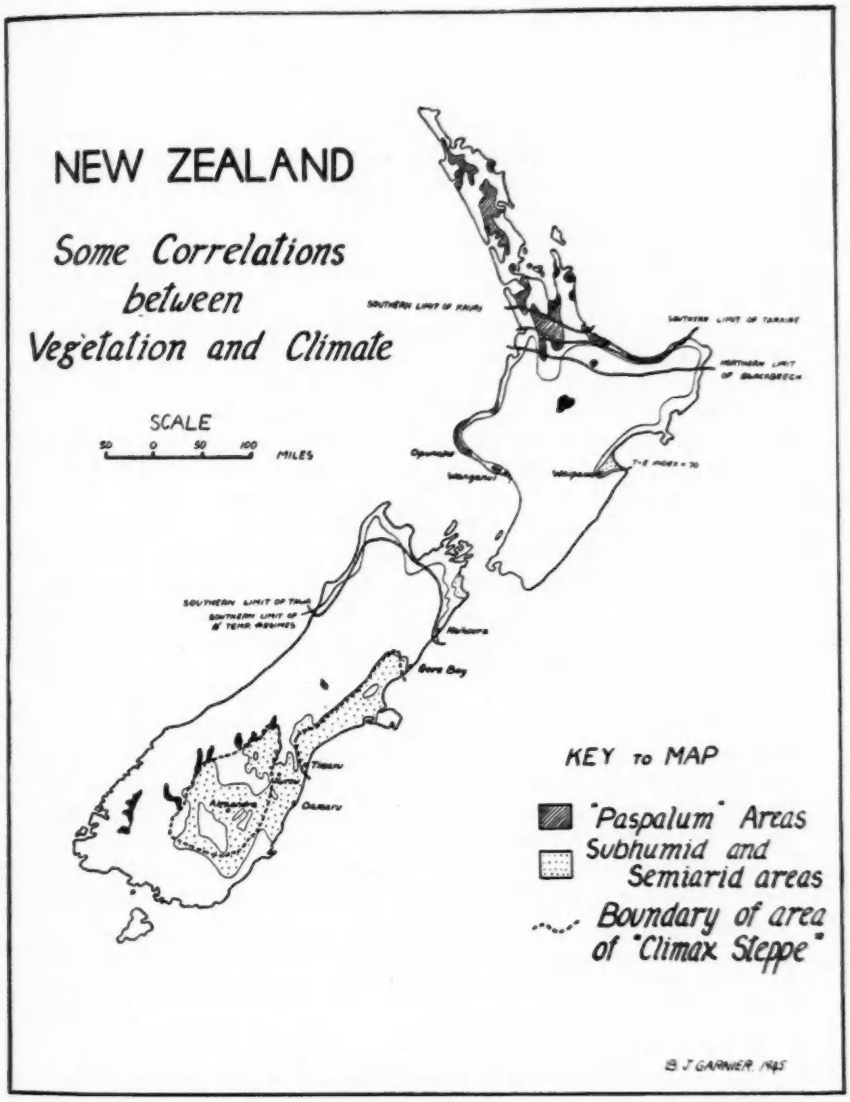
NEW ZEALAND
Some Correlations between Vegetation and Climate
SCALE
50 0 50 100 MILES
SOUTHERN LIMIT OF TARAIRE
Opunake
Wanganui
Napier
Gisborne
Hokitika
Timaru
Oamaru
KEY to MAP
"Paspalum" Areas
Subhumid and Semiarid areas
Boundary of area of "Climax Steppe"
B. J. GARNIER. 1945

FIG. 3

largely by temperature, but so far it has not been possible to determine whether it is the mean minimum or the absolute minimum temperature which is the limiting factor." Grassland associations in which *Paspalum* is dominant or very important are four in number. These have been combined as one type for the purpose of presenting their location on the map (Fig. 3). It will be seen that all *Paspalum* associations are located in areas where T–E indices are above 70. Moreover, with the exception of the *Paspalum* area near Wanganui, they are in regions where P–E indices are greater than 90.[21]

In the South Island a connection between the vegetation and temperature is shown in the line which marks the southern limit of Tawa. (See Fig. 3.) The boundary in this case follows the general demarcation between mesothermal and microthermal temperatures which distinguishes the northern South Island from the southern parts. A general correlation is also apparent between the subhumid and semiarid climate and the grassland areas of the South Island. The map which Zotov prepared for his paper on the tussock-grasslands of the South Island[22] and which has been used in the preparation of Figure 3 of this paper, reveals that grassland as a climax formation (Zotov's "climax steppe") occupied a large portion of the Canterbury plains and also a considerable area of Otago, with a northward extension into the McKenzie basin. The whole of this area is within the subhumid and semiarid zones. To that extent the correlation is satisfactory. However, some discrepancy appears to exist in relation to the zone of rainfall deficiency in the Timaru-Kurow-Oamaru triangle. Zotov claims this as an area of "induced steppe" and maintains that as such the grassland there is a successional type which, without interference, would pass through scrub back into forest. Such "induced steppe," according to Zotov, occupies wetter areas than "climax steppe."[23] This is against the conclusions of this paper which suggest that drier conditions prevail here than further north and that, consequently, the grassland here should certainly be a climax formation if such a formation occupies the subhumid zone farther north.

From the evidence available[24] it seems evident that the soils of the North Island correlate in a general way with the climatic regions which this paper

[21] In spite of the general correlation of forest types and *Paspalum* associations with the climate zone cited in the text, the absence of *Paspalum* associations and kauri-taraire forest in the warmer and wetter areas of the east coast of the North Island should be noted.

[22] V. D. Zotov: *op. cit.*, p. 215a.

[23] *Ibid.*, p. 213a, 220a.

[24] A soil map of the country has recently appeared in the N. Z. Journal of Agriculture, together with a brief description of the main types. (See *N. Z. Journ. Agric.*, Vol. 70 (1945), No. 4, pp. 387–397). But for the most part it is necessary to rely on published annual reports of the Department of Scientific and Industrial Research, especially those for 1940–1, and 1941–2, and various papers in scientific journals. A soil map of the South Island has not yet appeared.

has established. The generally humid and superhumid character of the country coincides well with the podsolic nature of mature soils. Moreover, the preponderance of grey-brown coloring is correct for soils which have developed under a mixed forest stand in a moderately cool climate. It is true that the temperature regime of the North Island is microthermal only on the central and southern highland and that elsewhere the climate is mesothermal.[25] But the temperature conditions in the latter province are only just high enough for the climate to be classed as B′. In fact, the highest T–E index for the whole island is only 81 (at Auckland). Thus, conditions are hardly warm enough for us to expect mature red or yellow podsols to be well developed as dominant soil types. But it is significant that yellow-brown loams are practically confined to the area where T–E indices are above 70 and that in the Bay of Islands district, where T–E indices are in the region of 80, red-brown loams ("ironstone soils") are "well developed."[26]

One area of the North Island, the Hawke's Bay subhumid zone should not display podsolic soil characteristics. If the present classification of climate is correct, the soils there should be prairierths and ought to link up with the soils of the subhumid zones of the South Island, especially those near Blenheim. At present the soils of the drier regions of Hawke's Bay (and also near Wanganui and the drier regions of the Manawatu) are classed as "yellow-grey loams" and those of the comparatively dry areas of Marlborough, Canterbury and Otago as "grey-brown loams."[27] More research is needed in order to establish whether or not these two soil types, which are peculiar to their respective locations, can, in fact, be classed as prairierths.

In the South Island a further region is of particular interest. The climate of central Otago has already been described as semiarid. The area covered by this classification should, accordingly, be characterized by chestnuterths. A recent report[28] classifies the soil there as "buff loam," but makes no attempt to relate it to any known world soil group. But it is significant that they are peculiar to no other part of New Zealand, just as the semiarid climate is limited to the same locality.[29]

[25] According to Thornthwaite (The Climates of North America, *op. cit.*) red-yellowerths should characterize the humid mesothermal regions.

[26] Soil Survey, Extract from the Annual Report of the Dept. of Sci. and Ind. Res., 1940–41, pp. 2–3.

[27] Soil Survey, *op. cit.*, 1940–41, p. 1 and 1941–42, p. 1.

[28] Soil Survey, *op. cit.*, 1941–2, p. 1.

[29] Gibbs and Raeside (*op. cit.*) class the soils of arid central Otago as belonging to the "Alexandra series." Soils of this series together with those of the Omarama series are both classed together as "Tussock soils." These, the authors claim, may possibly be related to the world groups of "prairie soils." The "Tussock soils" are developed on areas where the rainfall is under 35 inches, the "Alexandra series" occupying the drier parts where the rainfall is from 13 to 17 inches.

NEW ZEALAND
LOCATION MAP
SCALE
50 0 50 100 MILES
3000 FT. CONTOUR
Cape Maria van Diemen
Auckland
Mt Arohe
Hamilton
Rotorua
East Cape
Kaweka
Te Kuiti
New Plymouth
Egmont
Gisborne
Napier
Cape Kidnappers
Wanganui
Palmerston
Tongariro
Wellington
Westport
Cape Campbell
Kaikoura
Hokitika
Hanmer
Christchurch
Timaru
Oamaru
Dunedin
Invercargill
Bluff
B. J. GARNIER 1945

FIG. 4

CONCLUSION

It cannot be said that the classification of the climate of New Zealand which this paper has attempted is at all complete. Too many statistical gaps occur for the regional boundaries to be adopted as final.

Nevertheless, the paper has been successful in demonstrating some of the regional variety of the climate. In general terms, the climatic regions described have shown a broad correlation with the soil and vegetation areas of the land. But the contrasts in climatic type which it has been possible to show have not been major contrasts only. Minor differences in the efficacy of rainfall and temperature have been brought out which have indicated marked local climatic characteristics within the land. Differences of this type are significant to successful land occupance and, in a country where soil erosion is already a national menace, deserve detailed investigation in order to provide necessary information to those concerned with land policy.

CLIMATIC DATA FOR FORTY STATIONS IN NEW ZEALAND

** Figures in parenthesis after Temp. & Rain. give years duration of record.*

Station & height	Class	Figures	J	F	M	A	M	J	J	A	S	O	N	D	Year
Te Paki	BB′ra	Temp.(11)*	64.4	64.9	63.5	60.9	57.4	54.5	52.4	52.7	54.3	56.7	59.1	62.0	58.6
200 ft.		Rain. (12)	5.16	4.64	2.91	5.71	5.16	5.20	6.47	5.84	5.02	3.41	3.93	3.58	57.03
34° 30′ S.		P–E	8.32	7.35	4.50	9.96	9.70	10.22	14.03	12.26	10.08	6.26	6.90	5.83	115.41
		T–E	8.10	8.22	7.88	7.22	6.35	5.62	5.10	5.18	5.68	6.18	6.78	7.50	79.71
Waipoua	AB′ra	Temp.(15)	63.1	63.9	62.4	60.3	54.5	51.7	49.3	50.6	52.2	54.9	58.4	61.5	56.9
225 ft.		Rain. (16)	4.13	4.95	3.75	4.75	7.53	7.51	7.48	6.65	5.36	4.98	4.27	3.93	65.29
35° 30′ S.		P–E	6.70	8.05	6.11	8.33	15.75	16.87	17.98	15.10	11.44	9.92	7.69	6.57	130.51
		T–E	7.78	7.98	7.60	7.08	5.62	4.92	4.32	4.65	5.05	5.72	6.60	7.38	74.70
Riverhead	BB′ra	Temp.(14)	62.2	62.9	61.1	57.8	53.5	50.0	48.2	48.7	50.7	53.7	56.4	59.4	55.4
105 ft.		Rain. (16)	4.37	6.23	2.38	4.76	5.36	6.00	7.76	4.75	4.20	3.55	3.75	3.79	56.90
36° 40′ S.		P–E	7.28	10.60	3.75	8.75	11.06	13.80	19.35	11.10	9.10	7.03	6.98	6.60	115.40
		T–E	7.55	7.72	7.28	6.45	5.38	4.50	4.05	4.18	4.68	5.42	6.10	6.85	70.16
Auckland	BB′ra	Temp.(76)	66.3	66.7	64.9	61.4	56.8	53.1	51.3	52.1	54.4	57.4	60.3	63.6	59.0
160 ft.		Rain. (91)	3.15	3.77	3.20	3.92	5.09	5.47	5.75	4.65	4.03	4.00	3.60	3.19	49.82
36° 50′ S.		P–E	4.65	5.50	4.91	6.57	9.69	11.50	12.94	9.82	7.90	7.31	6.08	4.98	91.85
		T–E	8.58	8.68	8.22	7.35	6.20	5.28	4.82	5.02	5.60	6.35	7.08	7.90	81.08
Waihi	AB′ra	Temp.(37)	64.6	64.4	62.0	57.6	52.4	48.9	47.4	48.6	51.9	55.8	59.1	62.3	56.2
404 ft.		Rain. (45)	5.68	6.05	7.31	7.25	8.20	8.67	9.90	8.13	6.80	7.05	5.26	5.47	85.77
37° 20′ S.		P–E	9.92	9.93	12.86	13.96	18.02	21.51	25.80	20.02	15.05	14.23	9.51	9.28	180.09
		T–E	8.15	8.10	7.50	6.40	5.10	4.22	3.85	4.15	4.98	5.95	6.78	7.58	72.76
Te Aroha	BB′ra	Temp.(21)	67.0	66.1	63.7	58.9	53.3	50.3	48.6	50.0	53.2	57.3	60.6	63.9	57.7
46 ft.		Rain. (47)	3.65	3.59	4.10	4.80	5.57	5.26	6.70	5.21	4.80	4.34	3.94	3.45	55.41
37° 35′ S.		P–E	5.41	5.43	6.57	8.64	11.71	11.81	16.22	11.79	10.21	8.37	6.35	6.74	109.18
		T–E	8.75	8.52	7.42	6.72	5.32	4.58	4.15	4.50	5.30	6.32	7.15	7.98	76.71
Tauranga	BB′ra	Temp.(29)	64.3	64.9	62.4	58.4	53.4	49.8	48.5	49.6	52.4	56.0	58.8	61.9	56.6
100 ft.		Rain. (43)	4.13	4.05	3.96	4.94	4.93	5.35	5.02	4.57	4.23	5.01	3.52	3.84	53.55
37° 45′ S.		P–E	6.55	6.33	6.49	9.00	10.18	12.28	11.88	10.38	8.76	9.71	6.89	6.35	104.80
		T–E	8.08	8.22	7.60	6.60	5.35	4.45	4.12	4.40	5.10	6.00	6.70	7.48	74.10
Hamilton	BB′ra	Temp.(29)	63.8	64.1	62.0	57.6	52.0	48.2	46.9	48.2	51.5	52.9	58.2	61.5	55.7
131 ft.		Rain. (33)	3.71	3.24	2.93	3.82	4.75	4.69	4.96	3.96	3.58	3.91	3.78	3.26	46.59
37° 50′ S.		P–E	5.84	5.00	4.68	6.68	10.17	11.08	12.22	9.16	7.49	7.62	6.76	5.38	92.08
		T–E	7.95	8.02	7.50	6.40	5.00	4.05	4.72	4.05	4.88	5.72	6.55	7.38	73.22
Rotorua	BB′ra	Temp.(47)	64.1	63.5	61.2	56.3	51.0	47.1	45.7	47.0	50.4	54.2	57.5	61.4	55.0
931 ft.		Rain. (58)	4.42	4.12	3.49	4.61	5.53	5.29	4.93	5.02	4.79	4.98	4.29	3.75	55.22
38° 10′ S.		P–E	7.41	6.62	5.78	8.74	12.33	13.13	12.62	12.41	10.59	10.16	7.84	6.25	123.88
		T–E	8.02	7.88	7.30	6.08	4.75	3.78	3.42	3.75	4.60	5.55	6.38	7.35	68.86
Gisborne	BB′ra	Temp. (7)	65.3	64.6	62.0	59.5	53.2	49.0	47.3	49.2	51.8	56.0	58.8	62.8	56.6
26 ft.		Rain. (66)	2.36	3.07	3.59	3.48	4.48	4.02	4.36	3.67	2.55	2.22	2.46	1.92	38.18
38° 40′ S.		P–E	3.41	4.69	5.87	5.96	9.18	9.09	10.43	8.15	5.12	3.90	4.10	2.84	72.74
		T–E	8.32	8.15	7.50	6.88	5.30	4.25	3.82	4.30	4.95	6.00	6.70	7.70	73.90

CLIMATIC DATA (*Continued*)

Station & height	Class	Figures	J	F	M	A	M	J	J	A	S	O	N	D	Year
Onepoto, Lake Waikaremoana	AC′ra	Temp. (8)	60.0	59.9	57.5	54.4	48.3	44.3	41.9	43.3	45.6	50.5	53.6	57.6	51.4
2110 ft.		Rain. (19)	5.30	6.54	5.79	6.60	7.86	6.73	9.40	6.60	6.11	4.96	4.87	4.04	74.80
38° 50′ S.		P–E	9.40	11.93	11.00	13.72	19.59	18.61	29.30	18.85	16.00	11.10	9.92	7.03	176.42
		T–E	7.00	6.98	6.38	5.60	4.08	3.08	2.48	2.82	3.90	4.62	5.40	6.40	58.74
New Plymouth	BB′ra	Temp.(22)	62.5	63.1	61.5	58.8	54.0	50.5	48.8	49.8	52.0	55.0	57.3	60.6	56.2
60 ft.		Rain. (67)	4.35	4.11	3.55	4.67	6.03	6.06	6.31	5.55	4.98	5.48	4.79	4.40	60.28
39° 05′ S.		P–E	7.20	6.67	5.88	8.42	12.53	13.87	15.22	12.82	10.68	11.03	8.92	9.61	122.85
		T–E	7.62	7.78	7.38	6.70	5.50	4.62	4.20	4.45	5.00	5.75	6.32	7.15	72.47
Chateau Tongariro	AC′rb	Temp. (9)	52.1	52.8	50.9	47.2	40.7	36.9	35.1	36.9	39.1	43.2	46.0	49.7	44.2
3670 ft.		Rain. (10)	9.58	9.40	5.47	9.01	8.48	8.74	6.53	6.25	6.36	7.25	7.53	9.50	94.10
39° 10′ S.		P–E	22.70	21.25	12.18	23.60	27.30	32.50	25.50	22.40	21.00	21.00	19.95	23.40	272.78
		T–E	5.00	5.20	4.72	3.80	2.18	1.22	0.78	1.22	1.78	2.80	3.50	4.42	36.62
Karioi	BC′rb	Temp.(15)	56.5	56.7	54.4	50.9	44.5	40.9	39.1	40.8	43.1	48.0	51.4	54.8	48.4
2125 ft.		Rain. (16)	3.76	3.26	2.73	3.83	4.64	4.97	4.46	3.95	3.81	4.08	4.48	4.08	48.05
39° 25′ S.		P–E	7.00	6.00	5.18	8.22	12.16	15.00	14.07	11.62	7.75	9.60	9.66	7.95	114.21
		T–E	6.12	6.18	5.60	4.72	3.12	2.22	1.78	2.20	2.78	4.00	4.85	5.70	49.27
Hastings	CB′rb	Temp.(16)	65.4	64.5	61.2	57.7	57.0	47.2	44.9	47.8	50.0	55.0	58.8	62.9	55.5
45 ft.		Rain. (52)	2.24	2.86	2.24	3.44	3.10	2.98	3.64	2.90	2.59	1.94	2.06	1.85	31.84
39° 40′ S.		P–E	3.46	4.33	3.54	6.21	6.51	6.92	7.08	6.61	6.79	3.94	3.63	2.73	61.15
		T–E	8.35	8.12	7.30	6.48	4.75	3.80	3.22	3.95	4.50	5.75	6.70	7.72	70.24
Taihape	BC′rb	Temp.(33)	59.0	59.0	56.6	52.8	46.6	42.9	41.4	42.7	45.6	49.9	52.4	56.3	50.4
2157 ft.		Rain. (37)	3.28	2.87	2.36	2.83	3.35	3.33	2.96	2.70	3.06	3.35	3.44	3.19	36.72
39° 40′ S.		P–E	5.69	4.92	4.15	5.60	6.22	8.96	8.25	7.14	7.48	7.35	7.06	5.90	78.72
		T–E	6.75	6.75	6.15	5.20	3.65	2.72	2.35	2.68	3.45	4.48	5.10	6.08	55.36
Wanganui	BB′ra	Temp. (6)	63.2	63.9	61.7	58.9	52.7	49.0	47.2	48.3	51.2	55.5	58.4	61.7	56.0
72 ft.		Rain. (54)	2.93	2.80	2.38	3.31	3.25	3.29	3.25	2.79	2.85	3.34	3.18	2.72	36.09
39° 55′ S.		P–E	4.58	4.36	3.74	5.77	6.60	7.35	6.61	6.26	5.88	6.30	5.60	4.32	67.37
		T–E	7.80	7.98	7.48	6.72	5.28	4.75	3.80	4.08	4.80	5.87	6.60	7.48	72.64
Palmerston North	BB′ra	Temp.(31)	63.0	63.2	60.8	56.5	51.4	47.9	46.2	48.0	50.8	54.4	56.7	60.4	54.9
100 ft.		Rain. (38)	2.99	2.51	2.47	3.22	3.27	3.46	3.12	3.19	2.97	3.58	3.30	3.00	37.08
40° 20′ S.		P–E	4.67	3.85	3.97	5.91	6.88	7.96	7.50	7.31	7.38	7.00	6.09	4.97	73.49
		T–E	7.78	7.80	7.20	6.12	4.85	3.97	3.55	4.00	4.93	5.60	6.20	7.10	69.10
Pahiatua	BB′ra	Temp.(16)	62.0	62.4	60.0	56.3	49.8	46.1	44.2	46.6	49.4	53.4	56.5	60.4	53.9
384 ft.		Rain. (44)	3.77	2.99	3.29	4.50	4.79	4.89	4.90	4.23	4.21	5.30	4.74	3.74	51.35
40° 25′ S.		P–E	6.21	4.77	5.61	8.58	11.07	12.38	13.20	10.40	9.50	11.15	9.02	6.37	108.26
		T–E	7.50	7.60	7.00	6.08	4.45	3.52	3.05	3.65	4.35	5.38	6.12	7.10	65.50
Wellington	BB′ra	Temp.(80)	61.2	61.2	59.3	55.8	51.4	48.0	46.4	47.3	50.1	53.0	55.6	59.0	54.0
415 ft.		Rain. (82)	2.91	2.93	2.83	3.48	4.16	4.19	4.87	4.18	3.45	3.62	3.13	3.16	42.91
41° 20′ S.		P–E	4.83	4.80	4.79	6.54	8.92	9.82	12.14	9.87	7.48	7.33	5.87	5.48	87.87
		T–E	7.30	7.30	6.82	5.95	4.85	4.00	3.60	3.82	4.52	5.25	5.90	6.75	66.06

CLIMATIC DATA (*Continued*)

Station & height	Class	Figures	J	F	M	A	M	J	J	A	S	O	N	D	Year
Nelson	BB′ra	Temp.(23)	62.7	62.9	60.4	56.8	50.7	46.5	45.3	46.9	50.2	54.4	57.2	60.9	54.6
24 ft.		Rain. (61)	2.91	2.75	2.86	3.09	3.24	3.54	3.40	3.21	3.45	3.47	3.03	3.04	37.99
41° 20′ S.		P–E	4.57	4.26	4.73	5.62	6.90	8.52	8.51	7.65	7.44	6.74	5.42	4.98	75.64
		T–E	7.68	7.72	7.10	6.20	4.68	3.62	3.32	3.72	4.55	5.60	6.30	7.22	67.71
Blenheim	CB′da	Temp.(11)	64.3	64.1	60.8	56.3	49.6	44.9	43.8	46.1	50.1	54.8	58.1	62.3	54.6
30 ft.		Rain. (12)	1.79	1.89	1.52	1.85	2.43	2.32	2.67	2.32	2.13	2.03	1.91	1.78	24.04
41° 30′ S.		P–E	2.56	2.74	2.30	3.18	5.19	5.62	6.80	5.44	4.40	3.67	3.16	2.67	47.73
		T–E	8.08	8.02	7.20	6.08	4.40	3.22	2.95	3.52	4.52	5.70	6.52	7.58	67.79
Golden Downs	BC′rb	Temp.(14)	59.5	59.5	56.7	52.7	46.3	41.9	40.9	42.7	46.6	57.2	54.2	57.9	50.8
900 ft.		Rain. (15)	4.42	4.13	2.71	4.31	3.45	5.73	3.91	5.12	3.10	3.47	4.12	3.85	48.32
41° 35′ S.		P–E	7.76	7.22	4.80	8.90	8.30	16.80	11.35	14.42	7.77	7.30	8.20	7.08	109.90
		T–E	6.88	6.88	6.18	5.18	3.58	2.48	2.22	2.68	3.65	4.80	5.55	6.48	56.56
Westport	AB′ra	Temp. (6)	60.0	60.4	58.5	55.9	51.3	48.3	47.1	47.6	50.1	52.8	54.7	58.2	53.7
23 ft.		Rain. (13)	7.00	4.52	6.00	6.42	6.25	7.18	6.51	6.48	6.35	7.12	6.81	6.74	77.40
41° 45′ S.		P–E	12.84	7.85	11.12	12.86	14.02	17.80	16.60	16.21	14.72	15.47	14.05	12.80	166.44
		T–E	7.00	7.10	6.62	5.98	4.82	4.08	3.78	3.70	4.52	5.20	5.68	6.55	65.23
Hanmer	BC′rb	Temp.(23)	59.6	59.3	56.6	51.8	44.8	40.2	38.6	41.3	46.2	51.0	53.8	57.8	50.1
1225 ft.		Rain. (39)	3.71	3.53	3.21	3.38	4.39	3.44	4.35	3.28	4.46	3.88	3.54	3.87	45.04
42° 30′ S.		P–E	6.46	6.14	5.67	7.04	11.40	10.20	14.00	9.38	11.18	8.31	7.00	6.98	102.76
		T–E	6.90	6.82	6.15	4.95	3.20	2.05	1.65	2.32	3.55	4.75	5.45	6.45	54.24
Balmoral	CC′rb	Temp.(16)	61.3	60.9	58.0	53.2	46.4	41.8	40.2	42.9	47.8	52.5	55.5	59.5	51.7
743 ft.		Rain. (16)	2.13	2.01	1.49	1.88	2.58	1.85	2.08	1.97	2.40	2.21	2.27	2.26	25.13
42° 40′ S.		P–E	3.33	3.15	2.40	3.50	6.06	4.85	5.82	4.98	5.38	4.27	4.08	3.69	51.51
		T–E	7.32	7.22	6.50	5.30	3.60	2.45	2.05	2.72	3.95	5.12	5.38	6.87	58.98
Hokitika	AC′ra	Temp.(46)	59.6	60.0	57.8	54.5	49.3	45.8	44.7	46.0	49.1	52.2	54.4	57.8	52.6
12 ft.		Rain. (65)	10.27	7.53	9.41	9.33	9.56	9.14	8.59	9.35	8.88	11.51	10.48	10.27	114.32
42° 45′ S.		P–E	19.80	13.92	18.80	19.90	23.80	25.00	25.30	25.50	21.90	27.15	23.12	20.31	264.50
		T–E	6.90	7.00	6.45	5.62	4.32	3.45	3.18	3.50	4.28	5.05	5.60	6.45	61.80
Lake Coleridge	BC′rb	Temp.(24)	59.9	60.1	57.0	53.0	45.6	41.4	39.1	42.9	47.4	52.7	55.4	58.7	51.1
1220 ft.		Rain. (31)	2.68	2.03	1.90	2.96	2.78	2.38	2.93	2.79	3.09	2.92	2.52	2.45	31.45
43° 20′ S.		P–E	4.46	3.22	3.21	5.86	7.00	6.50	8.85	7.35	7.22	5.80	4.65	4.11	68.23
		T–E	6.98	7.02	6.25	5.25	3.40	2.35	1.78	2.72	3.85	5.18	5.85	6.68	57.31
Christchurch	CC′rb	Temp.(56)	61.4	60.8	58.1	53.6	47.6	43.3	42.3	44.3	48.7	53.1	56.3	59.9	52.4
22 ft.		Rain. (67)	2.20	1.69	2.00	1.85	2.75	2.46	2.86	1.81	1.90	1.79	1.89	2.36	25.56
43° 30′ S.		P–E	3.44	2.61	3.33	3.39	6.25	6.30	7.60	4.35	4.01	3.33	3.30	3.84	51.75
		T–E	7.35	7.20	6.52	5.40	3.90	2.82	2.52	3.08	4.18	5.28	6.08	6.98	61.31
Methuen	BC′rb	Temp.(16)	58.8	59.2	56.8	52.6	47.3	42.9	41.0	43.6	47.0	51.6	54.5	58.0	51.1
1217 ft.		Rain. (31)	4.06	3.33	2.93	3.16	3.11	2.57	2.89	2.67	3.45	3.36	3.46	3.88	38.87
43° 40′ S.		P–E	7.24	5.73	5.29	6.40	7.28	6.70	8.16	6.88	8.19	7.05	6.70	7.02	82.44
		T–E	6.70	6.80	6.20	5.15	3.82	2.72	2.25	2.90	3.75	4.90	5.62	6.50	57.31

CLIMATIC DATA (*Continued*)

Station & height	Class	Figures	J	F	M	A	M	J	J	A	S	O	N	D	Year
Onawe (Akaroa)	BB′ra	Temp. (6)	62.7	62.2	59.9	56.2	50.8	46.4	45.0	46.4	50.1	54.1	57.2	60.9	54.3
150 ft.		Rain. (10)	3.13	2.95	2.83	3.28	5.51	4.70	5.79	3.46	4.14	1.85	2.72	2.41	42.77
43° 50′ S.		P–E	4.98	4.68	4.68	6.10	12.27	11.78	15.40	8.30	9.13	3.34	4.78	3.84	89.28
		T–E	7.68	7.55	6.98	6.05	4.70	3.60	3.25	3.60	4.52	5.52	6.30	7.22	66.97
Hermitage, Mt. Cook	AC′rb	Temp. (10)	54.5	56.1	54.9	48.8	41.0	35.9	33.5	37.8	42.1	47.4	51.5	55.6	46.6
2510 ft.		Rain. (26)	19.43	12.17	15.21	17.46	12.51	11.99	8.29	11.39	12.38	16.71	12.99	10.88	161.41
43° 45′ S.		P–E	40.00	26.18	34.55	40.00	40.00	40.00	36.13	40.00	39.88	40.00	31.65	23.41	431.80
		T–E	5.62	6.02	5.72	4.20	2.25	0.98	0.38	1.45	2.52	3.85	4.88	5.90	43.87
Ashburton	CC′rb	Temp. (17)	60.0	60.0	57.3	52.3	46.0	41.3	40.4	43.0	46.7	51.9	54.7	58.0	51.1
323 ft.		Rain. (35)	2.65	2.37	1.96	2.38	2.37	2.46	2.77	2.01	2.48	2.17	2.56	2.80	28.98
43° 55′ S.		P–E	4.58	3.85	3.35	4.65	5.54	6.71	7.89	5.08	5.69	4.23	4.70	4.86	61.13
		T–E	7.00	7.00	6.32	5.08	4.50	2.32	2.10	2.75	3.68	4.98	5.68	6.50	57.91
Lake Tekapo	CC′rb	Temp. (17)	57.2	57.1	54.4	49.2	41.5	36.6	33.8	37.2	42.3	48.1	51.6	55.6	47.0
2350 ft.		Rain. (17)	2.24	1.52	1.50	2.03	2.18	1.99	1.63	2.03	1.70	1.99	1.84	1.88	22.53
43° 55′ S.		P–E	3.84	2.55	2.64	4.21	5.89	6.34	5.75	6.10	4.28	4.28	3.54	3.26	51.63
		T–E	6.30	6.28	5.60	4.80	2.38	1.15	0.45	1.30	2.58	4.02	4.90	5.90	45.66
Fairlie	CC′rb	Temp. (17)	59.1	58.6	55.5	50.9	43.6	38.8	37.3	40.5	45.0	50.4	53.7	58.2	49.3
1000 ft.		Rain. (17)	2.80	2.08	2.50	2.24	1.80	2.15	2.69	1.59	2.35	2.23	2.27	2.86	27.56
43° 55′ S.		P–E	4.74	4.43	4.55	4.53	4.42	6.35	8.70	4.27	5.68	4.56	4.24	4.95	61.32
		T–E	6.78	6.65	5.88	4.72	3.88	1.70	1.32	2.12	3.25	4.60	5.42	6.55	52.87
Timaru	CC′db	Temp. (32)	60.6	60.3	57.4	53.3	46.9	42.6	41.6	43.9	47.8	52.9	55.6	58.9	51.8
56 ft.		Rain. (47)	2.42	2.00	2.16	1.66	1.46	1.85	1.78	1.36	1.87	1.87	1.99	2.54	22.96
44° 25′ S.		P–E	3.88	3.16	3.70	3.04	3.17	4.70	4.68	3.18	4.02	3.50	3.52	4.94	45.49
		T–E	7.15	7.08	6.35	5.32	3.72	2.65	2.35	2.98	3.95	5.22	5.90	6.72	59.39
Queenstown	BC′rb	Temp. (14)	59.3	60.2	56.8	51.5	45.0	39.5	37.5	41.3	46.0	50.8	53.9	58.9	50.1
1110 ft.		Rain. (54)	2.93	2.07	2.64	3.03	2.62	2.27	1.98	2.02	2.53	3.29	2.62	2.41	30.41
45° 00′ S.		P–E	4.93	3.30	4.65	6.23	6.41	6.62	6.12	5.44	5.98	7.00	4.98	4.02	65.68
		T–E	6.82	7.05	6.20	4.88	3.25	1.88	1.38	2.32	3.50	4.70	5.48	6.72	54.18
Alexandra	DC′db	Temp. (15)	61.6	61.6	57.4	51.7	42.6	37.4	36.6	41.1	46.6	52.6	55.7	60.4	50.4
520 ft.		Rain. (22)	1.81	1.16	1.13	1.51	0.98	0.78	0.65	0.68	0.75	1.22	1.10	1.34	13.11
45° 15′ S.		P–E	2.74	1.67	1.77	2.85	2.34	2.20	1.86	1.64	1.53	2.20	1.82	1.99	24.61
		T–E	7.40	7.40	6.35	4.92	2.65	1.35	1.15	2.28	3.65	5.15	5.92	7.10	55.32
Manorburn Dam	CC′rb	Temp. (15)	53.0	54.0	50.4	46.0	38.5	33.0	30.3	33.8	39.7	43.9	47.5	52.1	43.5
2448 ft.		Rain. (31)	2.40	1.71	1.90	2.00	1.88	1.38	1.00	1.10	1.29	1.78	2.04	2.09	20.57
45° 45′ S.		P–E	4.58	3.07	3.65	4.58	5.55	4.98	3.98	3.37	3.50	4.30	4.48	4.04	50.08
		T–E	5.25	5.50	4.60	3.50	1.62	0.25	0	0.45	1.92	2.98	3.62	5.02	34.71
Invercargill	BC′ra	Temp. (35)	57.2	57.3	54.8	51.1	46.3	42.7	41.3	44.1	47.4	50.9	52.8	55.7	50.1
12 ft.		Rain. (50)	4.18	3.28	3.95	4.08	4.35	3.59	3.25	3.19	3.20	4.07	4.16	3.97	45.27
46° 25′ S.		P–E	7.57	5.92	7.78	8.77	10.82	9.77	9.25	8.25	7.50	8.77	8.53	7.54	100.47
		T–E	6.30	6.32	5.70	4.78	3.58	2.68	2.32	3.02	3.60	4.72	5.20	5.92	54.14

Mitteleuropa in German Political Geography

HENRY CORD MEYER*

In his discussion of "Geography and Nationalism," which appeared recently in the pages of the *Geographical Review,* Professor J. O. M. Broek recalled that most American geographers had shown little interest in geopolitics until Germany started on its expansion in 1938, and observed that most of the recent books on the subject were more like autopsies than works of constructive thought.[1] The following study of the growth of political geographic thought in Germany and Austria on the subject of *Mitteleuropa* is, frankly, such an autopsy. It attempts to serve a useful purpose, however, by demonstrating how the ideas which developed among geographers of one national group about a European area, were gradually warped by the pressures of exaggerated nationalism and beaten into weapons of aggression. As such it constitutes an effort to follow one aspect of German intellectual history between 1870 and 1945 by tracing its development in the thinking of a single professional group, i.e., German geographers. The concluding section of this study observes (1) that the Nazi defeat probably marks a definite turning point in German thought; (2) that it has opened the way for new trends of political geographic thought to emanate from other nations in Middle Europe; and (3) that American geographers should not neglect the opportunity to keep themselves informed of these new developments.

I

For two generations *Mitteleuropa* was an expression used by German

* Dr. Meyer studied in Europe as American Exchange Student to Austria in an interval between his undergraduate degree at the University of Colorado and his M.A. degree at the University of Iowa. Subsequently he has received the Ph.D. degree at Yale and has been studying the Mitteleuropa movement under a grant-in-aid by the Social Science Research Council. He will now become Assistant Professor of History at Pomona College, Claremont, California. The present paper is published in the *Annals* under the sponsorship of Dr. Edward Ackerman.

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[1] H. A. Innes and J. O. M. Broek, "Geography and Nationalism," *Geographical Review,* XXXV (1945), 307.

geographers, economists, and politicians in Middle Europe.[2] From scattered beginnings it grew until it became an expression familiar to everyone living within that vaguely defined area.

Usually *Mitteleuropa* has been rendered into the other world languages as Central Europe, *Europe Centrale,* or *Sredniaîa Evropa,* but in the process of translation the term has lost its unique connotation.[3] It is specifically a product of German thought and represents conceptions of, and solutions for, the problems of Middle Europe. Friedrich Naumann, the forceful politician and writer of Wilhelmian Germany, gave the term *Mitteleuropa* worldwide circulation when his thought- and fear-provoking book of that name appeared in 1915. Much subsequent writing on the subject, in Germany as well as abroad, did not recognize that the term was differently used before Naumann gave it the mark of his personality, or that it was given still other meanings when it was employed by Nazi geopoliticians and social scientists.

Mitteleuropa has been used to designate greatly varying areas of Middle Europe and has had differing historical and political content. Carl Ritter, who with Humboldt laid the foundations of German scientific geography, influenced geographic thought for half a century with his division of Europe into eastern and western parts. The expressions, *Mitteleuropa, Zentral-Europa* or *Central-Europa* were occasionally used before 1880, but writers showed little concern for a more exact definition of the area.[4] Up to 1871 *Deutschland* was an accepted ethnic-geographic term for the German states

[2] The expression "German" is used as a collective term for all the people of Middle Europe considering themselves culturally German. When Germans of any specific area or state are mentioned, it will be as "Austrian-Germans" or "Reich-Germans." In this article the English expression "Middle Europe" includes Germany, while the term "Central Europe" excludes the Reich.

[3] Of *Europe centrale* Joseph Aulneau writes: "It is neither a state, nor a group of states. It has existed only in the imagination of conquerors or writers; it is a concept, not an entity. It seeks to group certain peoples under a determined plan or according to affinities, resemblances and similarities." *Histoire de l'Europe centrale* (Paris, 1926), p. 8.

[4] Hilda Ormsby's statement [in "The definition of Mitteleuropa and its Relation to the Conception of Deutschland in the Writings of Modern German Geographers," *Scottish Geographical Magazine,* LI (1934–35), 337–347] that the first mention of the term is in the title of G. B. Mendelssohn's book of 1836, which she cites as *Das germanische Mitteleuropa,* is incorrect; the title is *Das germanische Europa.* Mendelssohn was influenced by Herder (see his discussion of German cultural influences upon Europe, particularly in what he terms "das subgermanische Europa"), but he drew no political conclusions. The first geographical use of the term I have encountered is in *Petermanns Mitteilungen,* VII (1861), 203. Ritter referred in 1863 in one of his lectures at the University of Berlin to the "Gebirgsdiagonale für Mitteleuropa," but went no further in examining the term. See Hermann Wagner, *Allgemeine Länderkunde von Europa* (Leipzig, 1915), pp. 53–54.

and Austria and also an expression of political hope. After Bismarck established a *Deutsches Reich,* the term *Deutschland* was generally used in reference to the Reich alone, although geographers often continued to use it in its older connotation.[5]

Many geographers before 1914 found no reason to develop a *Mitteleuropa* concept, and those who did, disagreed with one another and at various times fundamentally altered their own findings. All these writers were strongly influenced by the Romantic revival of German history and to some extent reflected the political and cultural heritage of the Holy Roman Empire of the German Nation. Thus *Mitteleuropa* continued to be identified with historic Germany—the area extending southward from the North and Baltic Seas to the northern Carpathian and Alpine slopes. Hermann Wagner (1883) and Albrecht Penck (1887) described *Mitteleuropa* in this narrow historic sense.[6] In 1883 Emil Deckert, later known for his economic geographic studies of the Americas, published his *Staaten von Mitteleuropa,* which described Germany as potentially in a position to dominate the transportation, trade and cultural life of its neighbors Austria-Hungary, Switzerland, and the Low Countries. There is, however, no evidence that this work had much influence in the pre-1914 decades.[7]

At the turn of the century one finds several references to a *Mitteleuropa* divorced from the familiar cultural-historical background. Berthold Volz (1895) presented a *Mitteleuropa* comprising France, the Low Countries, Germany, and the Upper Danubian Basin.[8] Friedrich Ratzel at the same

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[5] During the period 1840–1870 the writings of Friedrich List and the Austrian economist, Freiherr von Bruck, discussed the potentialities of the area later called *Mitteleuropa,* but developed no geographical basis for it. They were re-discovered as *Mitteleuropäer* after the military and economic strategy of the Powers in the First World War had in fact created a *Mitteleuropa.* See Karl Kumpmann, *Friedrich List als Prophet des neuen Deutschland* (Tübingen, 1915); Richard Charmatz, *Minister Freiherr von Bruck—Der Vorkämpfer Mitteleuropas* (Leipzig, 1916); Friedrich Naumann, *Mitteleuropa* (Berlin, 1915). Paul de Lagarde, Biblical scholar and philologist, who tried to influence the politics and education of his times (1827–1891) and whose aggressive social-political writings were almost forgotten until revived by the Nazis, wrote in 1853 that he desired to see "Deutschland's boundaries, i.e., *Mitteleuropa,* established in such a manner that its inhabitants could sustain and defend themselves." Lagarde, *Deutsche Schriften* (Göttingen, 1892), p. 32.

[6] Hugo Hassinger, "Das geographische Wesen Mitteleuropas," *Mitteilungen der k.k. geographischen Gesellschaft in Wien,* LX (1917), pp. 450–451.

[7] Ormsby, *op. cit.,* 340. I have been unable to find references to this work in geographic literature before 1917. Otto Maull's necrology hardly mentions it. See "Emil Deckert," *Geographische Zeitschrift,* XXIII (1917), 57–62.

[8] Sixth edition of H. A. Daniels's *Handbuch der Geographie,* II, 23. The fifth edition (1882) lacked the concept.

time wrote about *"Mitteleuropa mit Frankreich."*[9] The difficulties of discerning *Mitteleuropa* in terms of physical geography alone were clearly indicated by Phillipson when he made a distinct differentiation between the younger south-European folded mountains and the older north-European plateaus. Only when he had finished with geological, climatic, and morphological phenomena and dealt with states and peoples did he make use of the expression.[10] Hermann Wagner, in his *Lehrbuch der Geographie* (1900), tentatively interpreted *Mitteleuropa* in a broader sense to include Great Britain and Italy.[11] Thus it was early demonstrated that a *Mitteleuropa* concept could not be developed on the basis of scientific geography alone.

Mitteleuropa first assumed real significance as a geographic expression when Joseph Partsch of the University of Breslau took the concept and, molding it in terms of physical, political, and economic geography, published a volume that today is still one of the monuments of German geographic literature. The appearance of his *Central Europe* (in 1903 in Halford J. Mackinder's *Regions of the World* series) evoked a worldwide response.[12] His *Mitteleuropa*[13] comprised an area within the lines: Ostend to Geneva, along the Alpine divide to Trieste, south to Valona, eastward along the Balkan mountain divide to Burgas, north to the Danube delta, and northwestward along the political boundaries of Roumania, Austria-Hungary and the German Reich. It was characterized by a three-fold unity of Alps, middle mountains and northern lowlands; wherever one of these elements vanished, *Mitteleuropa* came to an end. For the first time the concept included, in terms of physical geography, lands south of the Carpathians and the southern Alpine slopes. Latent in the conception was, what in subsequent decades became the dominant note of *Mitteleuropa* writing, the emphasis upon the rôle of German culture as the common denominator of the area. Partsch wrote: "German is understood everywhere from Galatz, Sofia, Sarayewo [*sic*], Trieste, Geneva, and Antwerp far into the interior of Russia. Only the most backward regions of Servia and Montenegro must be excepted. All the rest of Central [i.e., Middle] Europe, consciously or unconsciously, willingly or unwillingly, belongs to the sphere of German civilization."[14]

[9] *Geographische Zeitschrift*, IV (1898), 143–156.

[10] In W. Sievers, *Allgemeine Länderkunde*, I, *Europa* (1906).

[11] *Lehrbuch der Geographie* (1900), p. 763.

[12] Wrote J. Russell Smith, "Your book on Central Europe has made your name common in all geographical circles in America." Josef Partsch (E. Waldbaur, ed.), *Aus fünfzig Jahren, Verlorene Schriften* (Breslau, 1927), p. 15. Haushofer has stated that Mackinder, not Partsch, developed the concept. See *Zeitschrift für Geopolitik*, XIV (1937), 1.

[13] The manuscript, written between 1897 and 1899, was condensed in the Mackinder series, but appeared in full as *Mitteleuropa* (Gotha, 1904).

[14] Partsch, *Central Europe*, p. 142. He stated less directly the observation I have heard from Richard Hartshorne that in many sections it was the presence of Jewish elements and Yiddish which made German a *lingua franca* of Central Europe.

In relation to the later development of German thought, it is significant to note that Partsch's book was written by a man who lived near a boundary area of German-Slav struggle, had travelled much in Austria, and was more conscious than most of his Reich-German colleagues of ethnic problems in Middle Europe. Partsch was not associated with the chauvinistic Pan-German League, which at that time was the major center of agitation on behalf of Germans living in European areas outside of Germany.[15] The influence of this group was principally, though not strongly, felt in German political geography before 1914 through Paul Langhans, who became editor of *Petermanns Mitteilungen* in 1909.[16] Pan-German ideas were to have a far greater effect during and after the First World War when the experiences of blockade and isolation caused Reich-Germans to think more seriously about the potentialities of Middle Europe than had been the case during the pre-war era of world imperialism.

It was a common complaint of Austrian-Germans between 1890 and 1914 that their Reich-German "brethren" were more interested in world affairs than in Middle Europe, and that they were oblivious of the tense struggle which the Austrian-Germans in the Monarchy were experiencing in order to maintain their supremacy over the restive Slav nationalities.[17] This contrast was reflected in geographical circles; although hailed in Austria, Partsch was not generally accepted in Germany until the First World War had begun. Kirchhoff rejected his thesis because he could not find sound physical geographic reasons for it and refused to recognize its political geographic content.[18] Konrad Kretschmer's *Historische Geographie von Mitteleuropa* (1904) revealed a partial conversion: his *Germanisches Mitteleuropa,* with some non-German enclaves, included Germany, the Austrian half of the Habsburg Monarchy (minus Galicia and Dalmatia), German Switzerland, the Low Countries, and Denmark.[19] This

[15] The mid-European interests of the Pan-German League constituted only one part of their world-wide program and it was not the most significant aspect before 1914. See Mildred Wertheimer, *The Pan-German League, 1890–1914* (New York, 1924) and the memoirs of Heinrich Class, *Wider den Strom* . . . (Leipzig, 1932).

[16] Note also Langhans's *Alldeutscher Atlas* (Gotha, 1900), published with the encouragement of the Pan-German League.

[17] In 1901 the French journalist André Chéradame published his book, *L'Europe et la question d'Autriche au seuil du XX^e siècle,* a sensational exposé of what he considered an officially approved Pan-German plot to destroy the Habsburg Monarchy. He was effectively answered by Georges Weil's *Le pangermanisme en Autriche* (Paris, 1904). Chéradame and his work are treated in historical perspective by Irwin Abrams, "The Austrian Question at the Turn of the Twentieth Century," *Journal of Central European Affairs,* IV (1944–45), 186–201.

[18] *Petermanns Mitteilungen,* LI (1905), *Literaturbericht* No. 65.

[19] See page 27. Much the same is Robert Gradman, "Das mitteleuropäische Landschaftsbild nach seiner geschichtlichen Entwicklung," *Geographische Zeitschrift,* VII (1901), 361–377; 435–447.

same area constituted Friedrich Ratzel's narrower *Mitteleuropa* of 1907.[20] The uncomfortable political atmosphere of the pre-war decade—the growing sense in Austria-Hungary and Germany of their mutual dependence and the foreboding of an impending crisis in the Habsburg Monarchy—had its effect upon geographic writing. In this period Robert Sieger of Graz formulated his ideas of the geographical foundations of the Austro-Hungarian Monarchy, which sought to give scientific strength to a weakening political structure.[21] Other Austrian-Germans, too, were trying to convince their Reich-German colleagues that the generally accepted delimitation of *Mitteleuropa,* which bisected the Habsburg Monarchy at the Moravian Gap, was geographically untenable.[22] They were partially successful. L. Neumann, for instance, selected political geographic criteria in preference to physical geographic description and presented a *Mitteleuropa* composed of Germany, Austria-Hungary, Switzerland, the Low Countries, Luxemburg and Lichtenstein.[23] Ernst Friedrich's economic geography was similar,[24] as were the works of Heiderich and Oehlmann.[25]

Alfred Hettner, editor of the *Geographische Zeitschrift,* was one who opposed this trend. Rejecting political and anthropogeographic factors as artificial, he sought natural marine and mountain boundaries. His *Mitteleuropa* was encircled by Western, Southern, Southeastern, Eastern, and Northern Europe. Two-thirds of Austria-Hungary were excluded, while the valleys of the Vistula and its tributaries were added. This, too, was one of the rare pre-war concepts which extended *Mitteleuropa* beyond Germany's eastern political boundaries.[26]

E. Hanslik, a Habsburg patriot, developed another, extremely sophisticated concept in a series of publications. He conceived of a broad area of transition from (1) the western Eurasian peninsula to the Eurasian land mass; (2) maritime to continental climates; (3) the bourgeois culture of the West (with its great cities, industrial organization, complex social structure, and highly developed rural life) to the more primitive East (primarily agricultural and less educated, with a greater birth-rate, simple social organization, and semi-feudal property system). He drew the boundaries

[20] *Deutschland. Einführung in die Heimatkunde* (Leipzig, 1907).

[21] Sieger, Weber & Rauchberg, *Oesterreichische Vaterlandskunde für die oberste Klasse der Mittelschulen* (Wien, 1912).

[22] Hassinger, *op. cit.,* pp. 454–455 N.

[23] In Scobel's *Geographisches Handbuch zu Andrees Handatlas* (Leipzig, 1908).

[24] *Allgemeine und spezielle Wirtschaftsgeographie* (Leipzig, 1907); he added Denmark, but rejected the Low Countries.

[25] F. Heiderich in Andrees' *Geographie des Welthandels* (Frankfurt, 1909), I, 263 ff.; E. Oehlmann, ed., 26th edition of the von Seydlitzsche *Geographie* (Breslau, 1914), p. 18.

[26] *Grundzüge der Länderkunde,* I, *Europa* (Leipzig, 1907).

of the various factors which he selected within a *Mitteleuropa* comprising a triangle between Danzig-Königsberg, Trieste, and Odessa.[27]

At this point it is pertinent to inquire (1) if German geographers before 1914 drew any political conclusions for action from their *Mitteleuropa* ideas (or geopolitics), and (2) what influence the geographers as a group exercised upon German public opinion before the outbreak of the First World War. As one recalls the prominent rôle which geopolitical thought, and particularly its *Mitteleuropa* conception, played in the foreign and military policy of Nazi Germany, a comparison proves especially interesting.

In view of the plethora of political geographic literature since 1914 analyzing Germany's rôle as a mid-European power, it is necessary to recall the atmosphere of German thought and activity between 1890 and 1914. That period was the era of *Weltpolitik*. For one brief generation Germans indulged in an overseas trade and colonial imperialism, fostered a large naval construction program, and sought to spread their ideas the world over.[28] In a game for such global stakes, Middle Europe appeared by contrast to offer meager opportunities. Conflicts with France, England, or Russia were envisaged and prepared for by the Germans, but few of them anticipated the possible strategic consequences or the political-geographic alternatives of such struggles.

As regards the first question, there is little evidence that Reich-German geographers correlated their professional studies with their political opinions, although the Austrian-German geographers had, as shown above, taken steps in that direction. Arthur Dix in 1911 warned that Germany might not be successful in global competition and suggested she seek a land route to the undeveloped Near East to insure the availability of supplies in case of blockade.[29] Some other instances of such argument occurred, but not on the part of political geographers.[30]

The geopolitical influence was entirely lacking. For more than a decade before the war Rudolf Kjellén had been publishing sections of his geopolitical works in Stockholm, but they received scant notice. The Austrian-German geographer Sieger introduced Kjellén to the readers of the *Geographische Zeitschrift* in 1903, although he objected to the term *Geopolitik*.[31] Of Kjellén's next book (*Stormakterna*, I) Sieger wrote: "This can hardly

[27] In Hassinger, *op. cit.*, pp. 459–467.

[28] Note, e.g., Paul Rohrbach, *Der deutsche Gedanke in der Welt* (Leipzig, 1912).

[29] "Geographische Abrundungstendenzen in der Weltpolitik," *Geographische Zeitschrift*, XVII (1911), 1–18.

[30] Note Ernst Jäckh, *Der aufsteigende Halbmond* (Berlin, 1909); *Deutschland im Orient nach dem Balkankrieg* (München, 1913); and the Pan-German minority protest against *Weltpolitik*, Karl von Winterstetten (A. Ritter), *Berlin-Bagdad. Neue Ziele mitteleuropäischer Politik* (München, 1913).

[31] *Geographische Zeitschrift*, IX (1903), 481–482.

be called a geographic work, but it should interest geographers.[32] As he reviewed subsequent sections, he became more receptive and in 1912 suggested a German translation.[33] One month after the First World War had begun, when a *Mitteleuropa* was becoming apparent as a result of the military and economic strategy of the European Powers, an abridged translation of Kjellén's work was presented to a receptive reading public extending far beyond the limited circle of geographers.[34] And through this Swedish political scientist Germans outside of intimate geographic circles first became acquainted with Ritter, Ratzel, Deckert, Haushofer, Dix and others.[35]

Hugo Hassinger answered the question of the influence of geographers upon official policy, when he said in Vienna in 1917: "The reasons for the insignificant influence of our geographic thought can be found in the Cinderella rôle to which geography was condemned in our secondary schools and to the fact that it was often taught there by non-professional men;[36] above all, political science, history, and economics did not recognize the importance which geography might have for them. One can thus realize how it was that many statesmen, and even more political scientists and economists . . . regarded the State only as an *abstract legal concept* and not as a *living organism*. They had heard nothing of the basic concepts or of the developmental factors of geography, and in their practical activity they were not touched by even a breath of geographic spirit. . . ."[37] Geography in its application to politics was introduced to a broad German public as the result of a two-front war, much as a global war brought political geography to the attention of the American people a generation later.[38]

II

The general *Mitteleuropa* literature of the First World War is almost endless.[39] The first contributions came from the pens of Austrian Pan-Germans of Bohemia; within a year interest and enthusiasm had spread to every corner of the two Empires. As a slogan *Mitteleuropa* was used by

[32] *Ibid.*, XI (1905), 649.

[33] *Ibid.*, XII (1906), 591–593; XVIII (1912), 475–476. Note also Sieger's necrology of Kjellén, *Zeitschrift für Geopolitik*, I (1924), 339–346.

[34] Published as *Die Grossmächte der Gegenwart* (Leipzig, 1914).

[35] See comments of Walter Vogel, "Politische Geographie und Geopolitik," *Geographisches Jahrbuch*, XLIX (1934), 49–80.

[36] Note in this connection, "Die Zukunft des geographischen Unterrichts, Rückblicke und Ausblicke," *Petermanns Mitteilungen*, LXI (1915), 453 ff.

[37] Hassinger, *op. cit.*, pp. 439–440.

[38] See Albrecht Penck, "Der Krieg und das Studium der Geographie," *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1916, pp. 158–176.

[39] My forthcoming book on the *Mitteleuropa* movement in the First World War will deal with some of this material.

persons and groups representing almost every shade of political and economic opinion, from the reactionary Pan-German League to right-wing Social Democrats. It covered a multitude of differing and conflicting ideas and plans. Friedrich Naumann wrote the best-known contribution to the *Mitteleuropa* wave and was heralded as the prophet of a new era. With their *Weltpolitik* a shattered dream, and faced with the realities of making the most of their continental resources, the Reich-Germans rediscovered their neglected continental historic and cultural heritage.[40] Libraries, institutes, and societies were established to spread information about Austria-Hungary, the Balkans, and the Near East. The enthusiasm reached its greatest extent during 1916–1917. Thereafter it declined as new political aims developed. Interest in Eastern Europe, which appeared to offer greater potentialities, supplanted the relatively limited gains of a *Mitteleuropa* comprising Germany and Austria-Hungary and the superficial Berlin-Bagdad agitation. With the treaties of Brest-Litovsk and Bucharest, Finland, the Baltic States, the Ukraine, and Roumania, were earmarked for domination by the Central Powers. Before this new situation could be properly digested in geographic circles and commented upon, the Central Powers had been defeated.[41]

The exigencies of war under conditions of blockade and isolation, together with the Pan-German clamor for annexations, heightened popular interest in the geographic aspects of Middle Europe. Political geographers had opportunities to present studies in some of the more widely read newspapers and magazines. *Mitteleuropa* maps of every description were published and sought after. Under these circumstances a considerable amount of superficial, emotionalized, patriotic writing appeared from the pens of political commentators and representatives of pressure groups, which was popularly accepted as political and strategic geography.[42] The seeds of geopolitics began to sprout as further writings of Kjellén, Haushofer, Dix, and others were eagerly read.

Three significant changes occurred in more scholarly geographical circles between 1914 and 1918: (1) Robert Sieger's geographical justification for the Habsburg Monarchy gained a wider acceptance; Austria-Hungary and the Reich in alliance, straddling the low saddle between the Danubian

[40] For instance, Herman Oncken, *Das alte und das neue Mitteleuropa* (Gotha, 1917) and the works on List and Bruck cited above.

[41] Popular writing on German relations with Eastern Europe was already abundant in 1915–1916. Note my article, "Rohrbach and his Osteuropa," *Russian Review,* II (1942–43), 60–69.

[42] Convenient bibliographical references for such materials are: the *Bibliographische Vierteljahrshefte* of the Stuttgart *Weltkriegsbücherei,* and the bibliographies of the *Musée et Bibliothèque de la Guerre* of Paris. In this country the Hoover Library on War, Revolution, and Peace has probably the finest collection of such materials.

and Elbe Basins, formed a *Mitteleuropa* which the war appeared to be welding into an inseparable human and economic community.

(2) Before the war *Mitteleuropa* concepts had usually halted at the eastern boundaries of the two Empires; as Russian resistance weakened, however, the concepts expanded with the eastward movement of the victorious armies of the Central Powers. Hermann Wagner was not only converted to the Austrian view; he went beyond the pre-1914 political boundaries to find new physical geographic frontiers. The eastern boundary of his broader *Mitteleuropa* ran from Riga to the mouth of the Dniester River, while at the west it included all of France.[43] His narrower, or Germanic, *Mitteleuropa* remained about the same as in his 1883 concept, except that it extended eastward to the Pripet Marshes. W. Sievers argued for a similar concept, but in compromising between physical and political geography, drew his western boundary along the more generally accepted line running southeastward from the Pas de Calais.[44] Theodore Arldt in 1917 sought a strategic geographic eastern boundary for his *Mitteleuropa,* comprising nations, "which by agricultural and population characteristics, culture and history were closely attached to Germany, to *Mitteleuropa* in the narrowest sense."[45] Restraint was hardly the tone of his concept: it included the Low Countries, all Scandinavia, the Baltic States, Poland, the Ukraine, Austria-Hungary, and the entire Balkan peninsula.

(3) While political dreamers coined the slogans Berlin-Bagdad and Hamburg-Kuweit, from a geographic point of view the most significant event which occurred was the "re-discovery" of the Danube. The development of oceanic transportation and the westward orientation of Reich-German interest after 1871, together with the reactionary agrarian protectionism of Hungary, had left the Danube relatively little used and under-developed as a modern waterway. This fact was reflected in geographic thinking. Until 1900 *Mitteleuropa* followed the Danube southeastward only as far as the Vienna Basin; by 1914 it extended to the Iron Gate; the pressure of war brought the river again into prominence as an artery of Central European communication.[46]

[43] Wagner, *op. cit.,* p. 53.

[44] *Die geographischen Grenzen Mitteleuropas* (Giessen, 1916); thus p. 4: "What today is regarded as *Mitteleuropa* in political geographic respects can assume other delimitations as a result of future points of view, for physical geography with its static factors is not the only criterion for delimiting such an area. Political geography is not as stable as physical geography and I am convinced that as a result of the war the concept of *Mitteleuropa* will extend further eastward."

[45] *Die Völker Mitteleuropas und ihre Staatenbildungen* (Leipzig, 1917), p. 1.

[46] There is a large specialized wartime literature on the Danube and Middle European waterways. Note, *e.g.,* Franz Heiderich, *Die Donau als Verkehrsstrasse* (Wien, 1916) and the differing view, G. E. Graf, "Der Donauweg: geographische Bedenken zu politischen Illusionen," *Neue Zeit,* XXXIV, i (1916), 609–621.

The best combined presentation of these new factors was made in 1917 by the Viennese geographer, Hugo Hassinger. His concept marks one of the milestones in the development of the *Mitteleuropa* idea, for, in addition to physical extension, it introduced for the first time an element of geopolitical dynamism.[47] Germany (with Russian Poland), the Low Countries, Switzerland, and Austria-Hungary constituted a developed area, while an emerging *Mitteleuropa* was developing under German aegis at the Southeast, in the Save and lower Danubian valleys. This mid-European area, occupying a median position between the diverse peninsulas and islands of Western Europe and the monotonous unity of Eastern Europe, Hassinger saw destined to become a closely integrated economic community, drawing strength from overseas trade through the North Sea gateway and capable of exploiting the potentialities of the Near East. And he considered the Austro-Hungarian Monarchy particularly fitted as a state system to organize the area culturally and politically.

A few geographers, however, still rejected the expanded *Mitteleuropa*. Gustav Braun, for instance, objected to the incipient geopolitical tendencies and reiterated the importance of finding physical geographic criteria. He preferred to see a coincidence of these criteria with cultural geographical factors in the mid-European landscape, and set off *Mitteleuropa* within a ring of boundary areas composed of plateaus and thinly-populated forest areas, thus arriving at a concept close to that of Alfred Hettner.[48] The Austrian, Hanslik, in 1917 substituted Habsburg dynastic influence for German hegemony and visualized a state within the triangle Danzig-Constanza-Trieste (including most of the Balkan peninsula except Greece), which he called *Donautafel* or *Oesterreich*. " 'Austria,' he wrote, 'is eastern territory, the first contiguous chain of small nations in Eastern Europe!' "[49]

An interesting attempt was made by Albrecht Penck to find a term other than *Mitteleuropa* to express mid-European relationships. He felt that *Mitteleuropa* had assumed such a specific connotation as the center of Europe that it was no longer acceptable as a term for a longitudinal geographical differentiation. Accordingly he coined the word *Zwischeneuropa* for the area lying between *Vordereuropa* (comprising Norway, the British Isles, France and Iberia) and the 30th Meridian east of Greenwich, beyond which extended *Hintereuropa*.[50] Penck was here opposing the unscientific channels into which German geography was moving, namely, the tendency

[47] Hassinger, *op. cit.*, pp. 476–493.

[48] *Mitteleuropa und seine Grenzmarken* (Leipzig, 1917).

[49] "Oesterreich ist Osterde, die erste zusammenhängende Länderkette des Ostens." Quoted in Hassinger, *op. cit.*, pp. 462–463.

[50] *Meereskunde*, 1916, No. 106.

to give greater weight to political and anthropological criteria than to scientific geographic data.[51]

III

Between 1880 and 1914 several different *Mitteleuropa* concepts were developed by some German geographers. Among them the Austrian-Germans displayed a marked preference for the political aspects of the question. As a result of the isolation of the First World War and the introduction of geopolitical methodology, *Mitteleuropa* ideas assumed paramouncy in German geographical circles and political criteria were further emphasized.

With the signing of the armistice, all *Mitteleuropa* ideas fell temporarily into disfavor. Those Austrian-Germans who had been the first to propagate them in 1914, temporarily shifted the emphasis of their political arguments to another aim—the *Anschluss*. Some German political geographers did not at once accept the new "science" heralded by Haushofer's lectures and the appearance of the *Zeitschrift für Geopolitik*, but most of them were influenced by deductions drawn from the experiences of the war. The unrestrained atmosphere of *Weltpolitik* had given way to a primary concern with continental relationships. In minds obsessed with fears of blockade and privation, minds which sought to evaluate political geographic tendencies in terms of economic, organizational, and military factors, the survival of *Mitteleuropa* concepts was a foregone conclusion.

Associated as it was with vanquished hopes, the term *Mitteleuropa* for a time lost its broader emotional appeal and the attempt was made to tie it again more closely to physical geographic criteria. The expression, however, was now universally accepted by German geographers, and generally included Germany, the Low Countries, Switzerland, Austria, Bohemia-Moravia, and the Vistula Valley.[52] Occasionally concepts went beyond these limits; one study included all the Succession States and the Baltic States.[53]

When Germans had found themselves together in a besieged wartime *Mitteleuropa*, some concern for their common interests had developed, a process accelerated by Pan-German agitation. The war settlement presented what appeared to be contradictory phenomena: the ideal of self-determination and the establishment of many new minority communities. The total effect of these diverse factors was to intensify German nationalistic feeling. In the post-war *Mitteleuropa* concepts the former emphasis upon cultural affinity was shifted to the realm of political relationships. Again, these

[51] Note Sieger and Penck, "Zwischeneuropa?" *Zeitschrift der Gesellschaft für Erdkunde*, 1916, pp. 177–180.

[52] Thus Alfred Hettner, "Mitteleuropa," *Grundzüge der Länderkunde*, I, *Europa* (Leipzig, 1925), pp. 135–254.

[53] R. Bitterling & T. Otto, *Mitteleuropa* (Berlin, 1930).

ideas were expressed most impetuously in Austria and Bohemia, the very areas which gave National Socialism some of its most radical impulses; and, in contrast to the pre-war era, these ideas were heartily reciprocated in the Reich. The urge for a complete German unification, which had been quieted in 1871, emerged again as an acute European problem, and under National Socialist auspices became the springboard of a vicious racial imperialism.

In this atmosphere the *Mitteleuropa* idea was gradually fashioned into a weapon of aggression and domination. True, until 1933 some political geographers were able to resist what thereafter became political compulsion,[54] but between 1927 and 1933 *Mitteleuropa* writing grew profuse again. *Mitteleuropa* institutes were established in Vienna, Dresden, and Leipzig and published studies.[55] German historians and economists developed *Mitteleuropa* concepts which leaned heavily upon political geography and geopolitik.[56] Most of this writing advocated various German-directed patterns of Central European organization which sought to supplant French influence in the area.[57]

With the advent of the Nazis, independent political geographic thought succumbed to the officially sponsored geopolitik, and Haushofer's interpretation of *Mitteleuropa* became the cue for further discussion of the subject. In his view *Mitteleuropa* was an expression of political will, a unique German invention; "Mitteleuropa," he wrote, "will be created with the German people, or it will *not* be created at all."[58] Between 1933 and 1939 the geopoliticians differentiated between a primarily German *Mitteleuropa* and a colonial *Südosteuropa*. The latter was "discovered" as an area heretofore neglected by Reich-Germans. National Socialism assumed the mission of bringing all German groups in Middle Europe into the frame of a *gesamtdeutsch* (entire-German) system. *Mitteleuropa* was projected even farther

[54] See Richard Hartshorne, "Recent Developments in Political Geography," *American Political Science Review,* XXIX (1935), 785–804; 943–966 and George Kiss, "Political Geography into Geopolitics," *Geographical Review,* XXXII (1942), 632–645.

[55] Note J. Stark & V. Korek, *Mitteleuropa Bibliographie, 1919–1934* (Berlin & Wien, 1935).

[56] See Paul Sweet, "Recent German Literature on Mitteleuropa," *Journal of Central European Affairs,* III (1934–44), 1–24. The historian Wilhelm Schüssler wrote of *Mitteleuropa:* "It is the one historic area where the fate of all Germans has been, and is, evolving. . . . Of decisive importance is the fact that it retains its unity only by virtue of the German element; Czechs, Slovenes, Poles, Hungarians, and Roumanians cannot unify this area. . . . By Germans all the peoples of this region are brought together; the German element is the common denominator." *Deutsche Einheit und gesamtdeutsche Geschichtsbetrachtung* (Stuttgart, 1927), p. 152.

[57] See H. E. Roos, "Mitteleuropa," *Europäische Gespräche,* X (1932), 245–260.

[58] In F. F. G. Kleinwächter & H. von Paller, *Die Anschlussfrage* (Wien & Leipzig, 1930), pp. 151–152.

south and eastward to include the *Streudeutschtum* (scattered-Germans) as far off as the Volga regions.[59] While many Germans hailed Hitler for completing the unfinished unification of 1871,[60] Nazi plans were already being drawn up which went beyond the relatively limited *Mitteleuropa* thought developed up to the end of the First World War. With the Munich settlement the decisive step was taken toward a continental racial imperialism. *Mitteleuropa* was no longer an end in itself, it had become a base of operation for an ideology that had developed beyond German bourgeois nationalism.

IV

The nations of Europe have determined that *Mitteleuropa* ideas shall not be permitted to threaten them again. They are taking measures to remove the danger of another Nazi empire. The threat of aggressive German nationalism is being met by the transfer of Germans from the new Poland, Czechoslovakia, Hungary, and Yugoslavia to Germany proper. These nations are seeking to limit German industrial influence in Central Europe by radically changing their economic relationships. *Mitteleuropa* concepts may reappear in the geographical literature of the next Germany, or of an independent Austria, but bitter experience has warned the world of their potential implications.

The extirpation of German influence in Central Europe gives the Slavic nations another opportunity to express their common mid-European or Central European interests in new political geographic concepts. Are American social scientists, particularly geographers, prepared to keep abreast of these new developments? For the most part, we are not. It must be admitted that today we know far less about Slavic geographic writing than ever we did of German, and that much of that knowledge has come to us through German presentations.[61] We have much to learn about Central Europe by going directly to Slavic sources.

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[59] R. von Schumacher, "Der Südostraum in der Konzeption Mitteleuropas," *Zeitschrift für Geopolitik*, XI (1934), 156–176; 222–239. The Leipzig Mitteleuropa-Institut became a Südosteuropa-Institut! Note *Leipziger Vierteljahrsschrift für Südosteuropa*, 1937 ff; S. H. Hummel, *Südosteuropa* (Berlin, 1937).

[60] See, e.g., Erwin Wiskemann, *Mitteleuropa. Eine deutsche Aufgabe* (Berlin, 1933) and Heinrich Ritter von Srbik, *Mitteleuropa* (Wien, 1938).

[61] Among sources for Slavic political geography of Central Europe might be mentioned: *Slavonic and East European Review, Monde Slav, Révue des études slaves*, and the *Journal of Central European Affairs*. Note Josef Pfitzner, "Die Geschichte Osteuropas und die Geschichte des Slawentums als Forschungsprobleme," *Historische Zeitschrift*, CL (1934), 21–85 and the reply of Jaroslav Bidlo, "L'europe orientale," *Monde Slav*, XII (1935), 204–233. Note also the French study of Jacques Ancel, *Manuel géographique de politique européenne, I., L'Europe centrale* (Paris, 1936).

A very superficial survey of materials in this field suggests some tentative points of departure for American scholars. During the inter-war period (1918–1939) Central European political geographers did not produce any concepts of mid-European unity which were as strong as the *Mitteleuropa* ideas. Moreover, Central European political geographic thought was even less tied to scientific geographic investigation and, like the German ideas, also possessed strong overtones of bourgeois nationalism.

Czech geographers produced much of the significant writing about the mid-European area during this period;[62] *Střední Evropa* is a Czech expression which possesses considerable diversity.[63] One of the best representatives of Czech political thought (with important geographic implications) is the well-known *Central European Observer,* which has stood close to official circles.[64] It fostered mutual understanding between the Baltic, Succession, and Balkan States, advocating regional economic and political agreements within the framework of the League of Nations. It also emphasized the traditional Czech mission of mediation between Russia and Western Europe.[65] Polish geographic thought was more concerned with Polish matters than with Central European political geography.[66] Hungarians long regarded their nation as the mainspring of Central Europe and, accordingly, found it difficult to adjust themselves to their new position after the First World War. In contrast to the Czech *Střední Evropa* their attitude was one of fanatic revisionism; at best they envisioned a Danubian

[62] On Czech geography see Jiří Král, ed., *Travaux géographiques; comptes rendus du IIe congrès des géographes tschécoslovaques* (Bratislava, 1933); Ladislav Jonaš, "Geografija v češkoslovaški republiki," *Geografski vestnik* (Ljubljana), II (1926), 133–139; and the issues of the *Sbornik československé společnosti zeměpisné.*

[63] Thus the *Masarykuv slovník naučný* divides Europe into western, southern, and central areas, the last described as the one "to which we belong." II (Praha, 1926) 654. Otakar Matousek's *Geologická mapa střední Evropy* defines the area quite narrowly, *Ibid.,* II, 640. *Střední Evropa* was also the name given maps illustrating the projected Central European plans of the chauvinist Hanuš Kuffner in *Naš stát a světovy mír* (Praha, 1918).

[64] Note also Kamil Krofta's *Stará a nova střední Evropa* (Praha, 1929).

[65] A basic work here is T. G. Masaryk, *The Spirit of Russia* (London, 1919).

[66] Jerzy Smolenski, "W sprawie ewolucji geografji politycznej," *Przegląd geograficzny,* XI (1931), 93–100; Charles Bierman, "Géographes et géographie en pologne 1934," *Bulletin de la société neuchâteloise de géographie,* XLIII (1934), 46–60; and J. Wasowicz, "Materialy do geo-politycznej polski," *Czasopismo geograficzne,* XV (1937), 215–244. Also Oscar Halecki, "L'histoire de l'europe orientale. Sa division en époques, son milieu géographique, et ses problèmes fondamentaux," *La pologne au Ve congrès international des sciences historiques, Bruxelles 1923,* (1924), pp. 73–94 and St. Pawlowski, *Polska wapolczena,* I, *Geografija polityczna,* (Warszawa, 1923). E. Romer's map of *Europa srodkowa* (1929) includes the central portion of Europe between France and Russia, and Scandinavia and the Adriatic.

Europe revolving around their own nation.[67] For two generations Roumanian studies have sought to penetrate the thick Slavic and Turkish veneer of Roumanian culture in order to discover and reassert a Roman (Dacian) individuality. Political geography, however, has had to deal with Roumania's position between three Slavic states.[68] A very recent product of Roumanian thought about Central Europe is the *Fedcentrope* idea, which suggests a federation of the states lying between Germany and Russia, including the Balkans and all Turkey.[69] Bulgarian political geography has often been associated with concepts of Bulgarian hegemony in the Balkans,[70] while differing views have come from Yugoslav circles.[71] It is difficult to discern how many of these threads of thought are being continued today. Central Europe has been undergoing a tremendous social upheaval in which, paradoxically, both communism and a resurgent nationalism are powerful elements.[72] Both seem likely to influence future political geographic writing in the area.

Russian interest in Central Europe before the First World War was strongly evidenced in political literature with a Pan-Slav undertone.[73] During the inter-war period Russian geographers confined themselves almost exclusively to studies of the vast regions of the Soviet Union. One of

[67] Thus P. Hantos, "Der Donauraum," *Comptes rendus du congrès international de géographie, Amsterdam, 1938* II, *Géographie économique*, pp. 229–243. Unusual are the several *Mitteleuropa* studies of Elemer Hantos. Note further, *A. magyar földrajzi irodalom. Bibliographie géographique hongroise* and the studies published by the University of Budapest, *Archivum europae centro-orientalis*, 1935–1939.

[68] An early anti-panslav work which first appeared in 1890 and was later translated into German is D. A. Sturdza, *Europa, Russland, und Rumänien* (Berlin, 1915). Note also J. Sölch, "Gross-Rumäniens politisch-geographische Stellung," *Geographische Zeitschrift*, XXIX (1923), 164–177.

[69] Carol A. Popper, *La Fedcentrope* (Bucarest, 1945). Primarily an economic study, this work nevertheless has interest for political geographers.

[70] Some indication of trends in the inter-war period is given in Comité d'organization du IVe congrès des géographes et ethnographes slaves, *La Bulgarie . . .* (Sofia, 1936), pp. 66–158 and bibliography. Note also L. S. Stavrianos, *Balkan Federation: A History of the Movement Toward Balkan Unity in Modern Times* (Northampton, Mass., 1944).

[71] Jovan Cvijić, *La péninsule balkanique* (Paris, 1918). Note Silvio Kranjec, "Geopolitičen oris Jugoslavije," *Geografski vestnik*, I (1926), 8–16 and Ludmil Hauptmann, "Geographische Tatsachen und politische Möglichkeiten in Mitteleuropa," *Hrvatski geografski glasnik*, No. 2, 1930, pp. 153–159.

[72] Indispensable for an evaluation of these factors today is the brilliant and suggestive work of Hugh Seton-Watson, *Eastern Europe Between the Wars, 1918–1941* (Cambridge, 1945).

[73] N. I. Danilevskii, *Rossiia i Evropa* (1871), translated as *Russland und Europa* (Stuttgart, 1920) is one of the more significant works. A competent German view of Panslavism is Alfred Fischel, *Der Panslawismus bis zum Weltkrieg* (Stuttgart, 1919).

the few indications of Russian geographic thought about Middle Europe is this definition of *Sredniaia Evropa* (Middle Europe) which obviously stems from German writings:

> A term denoting a part of Europe. Its boundaries are tentative and are drawn either on physical geographic or ethnic and political bases. The southern boundary is either the Alpine system or drawn between the northern shores of the Adriatic and Black Seas. The Northland Baltic Seas generally are considered its northern boundary. In the east it runs either along the course of the Vistula and the middle and lower parts of the Danube or along the outer limits of German settlement. The western boundary runs down from the Pas de Calais or along the German ethnic frontiers. Politically it includes Germany, Czecho-Slovakia, Austria, Hungary, Belgium, Holland and sometimes Denmark and Switzerland.[74]

This aspect of the situation appears to offer an interesting opportunity for some American scholar, i.e., to examine what changes, if any, have taken place in Russian political geographic thought in relation to Middle Europe since the quotation above was written.[75]

The destinies and ideas of all these nations have been profoundly affected by the war and its aftermath. New approaches to political geography are to be expected. In some cases intense national feeling may assert itself in political geographic writing about the mid-European area; on the other hand, the *Fedcentrope* concept seeks a broader synthesis with some curtailment of exaggerated ideas of national sovereignty. American political geographers who decide to keep abreast of the new ideas in Central Europe will have before them a field of investigation hitherto virtually untouched. They should not be deterred from it because its proper study will require the learning of a Slavic language. Too long have we had to depend upon German and other foreign scholars for much of our knowledge of Russia and Central Europe. It is time we set out for ourselves.

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[74] *Malaia sovetskaia entsiklopediia* (Moskva, 1930), VIII, 322–323.

[75] He might note, for example, *Trudy instituta slavianovedeniia akademii nauk SSSR* (1932 ff.) and the recent (since 1942) *Slaviane*. Of real interest, too, for Central European studies is Josef Stalin's first work, *Marxism and the National Question* (written in 1912–1913), which took an opposite view from the opinions of the present Austrian President, Karl Renner, in his *Staat und Nation* (1899), *Der Kampf der Nationen um den Staat* (1902), and later works.

Lessons from the War-time Experience for Improving Graduate Training for Geographic Research

Report of the Committee on Training and Standards in the Geographic Profession, National Research Council

The report is based on a conference held at Hershey, Pennsylvania, October 6–8, 1944, and on subsequent discussions of the preliminary report of that conference carried on by mail with committee members.

The conference was attended by the following committee members, together with the then president and secretary of the Association of American Geographers. Approximately half of those attending, as indicated by reference to their positions at that time, were employed in government agencies in Washington; the remainder were continuing in university work. Those from Washington included regular government workers, university men on leave for war-work, and others employed in war-time research with future positions uncertain.

Prof. Ralph H. Brown, University of Minnesota, Secretary, Association of American Geographers

Dr. Meredith F. Burrill, Board of Geographical Names, Department of the Interior

Prof. Charles C. Colby, University of Chicago

Prof. Vernor C. Finch, University of Wisconsin

Dr. Otto Guthe, Department of State

Lt. Col. Preston E. James, Office of Strategic Service (formerly at Univ. of Michigan, now at Syracuse University); although unable to attend the conference, Dr. James contributed to the subsequent discussions.

Dr. Lester Klimm, Military Intelligence Service (formerly and now at the University of Pennsylvania)

Dr. Charles E. Kellogg, United States Soils Survey, Department of Agriculture

Prof. Kenneth C. McMurry, University of Michigan

Major Arthur H. Robinson, Office of Strategic Services (now at the University of Wisconsin)

Mr. Victor Roterus, War Production Board, Washington, D. C. (now with City Planning Commission, Cincinnati)

Lt. (j.g.) Kirk Stone, Office of Strategic Services (now in General Land Office, Department of Interior)

Prof. J. Russell Whitaker, George Peabody College for Teachers

Prof. Derwent Whittlesey, Harvard University, President, Association of American Geographers

Dr. Richard Hartshorne, Office of Strategic Services (formerly and now at the University of Wisconsin), Chairman

The objectives of the conference were (1) to examine the contribution of professional geographers in war-time research for the government; (2) to endeavor to predict therefrom the research opportunities for professional geographers in the post-war period; and, especially (3) from an examination of the accomplishments and deficiencies of the war-time research by geographers, to present recommendations concerning the type and character of graduate preparation and the standards for geographic research that may enable the profession to make the most effective possible contributions in research.

The committee did not presume that governmental research, particularly war-time research, was the sole purpose for which professional geographers should be trained. Neither did it suppose that all the problems of training and standards would be raised, or raised in proper perspective, in a study of geographic work in Washington. Certain questions of major importance in geographic training are not considered in this report, or—as in the case of field training—considered only slightly. Finally, the constitution of the group, two thirds of whom are now at the time of final preparation of the report engaged in university work, should in itself be sufficient assurrance that the group does not regard applied geography, as distinct from academic research, as the essential purpose of the field.

On the other hand, it is an essential obligation of every discipline to be prepared to contribute to the solution of problems of our society to the utmost of which it is capable. Furthermore, it is a common experience in science that the attempt to apply the knowledge and training secured in academic work provides a specific test of the validity of the academic work. Since geography in America has had relatively little opportunity to experience this test, the members of the committee—both those engaged in the test and those from the universities who learned of the results at second-hand—were in unanimous agreement that the war-time experience offered an exceptional opportunity to examine the effectiveness of geographic training, even if the test was not a completely balanced one.

During the years 1944–45, a larger number of geographers were engaged in applied geography than at any other time in the history of American geography, probably a larger number than is likely to be so engaged for

some years to come. Most of them, over two hundred in number, were concentrated in Washington, working for a surprisingly large number of government agencies. They were engaged on a great variety of types of work, some recognized officially as "geographic" in character, others only indirectly geographic. The Committee felt it to be of first importance to assess the accomplishments of the profession in this work while those engaged in it could still think in terms of their current problems, and on the basis of the difficulties encountered to derive conclusions that would be of value for training future professional geographers, any of whom may hereafter be called upon to engage in some form of applied geography.

The statements concerning the contributions of geographers in war-time research, their accomplishments and deficiencies, were necessarily made by those of the group (and several others who subsequently contributed additions) who were working in Washington. In analyzing the basic factors involved, and in drawing up the recommendations for graduate training, the members from the universities took full part.

A. CONTRIBUTIONS OF GEOGRAPHERS IN WAR-TIME RESEARCH

(The term "geographer" is used in this report to indicate research workers who had had formal university training in geography.)

1. *Detailed regional surveys.* This work requires collection from a wide variety of sources of specific information on all significant features of an area and their presentation in form readily usable by non-geographers, particularly in the form of maps.

The presentation is in topical form, within each major region, with relatively minor development of regional break-down and regional synthesis. The topical outline is similar to that traditional in geographic work, proceeding from detailed description of natural features to economic, with more general consideration of social and political aspects. Usually there is a much greater emphasis on details of communications—railroads, roads, telecommunications, etc., including technical details—than is normally found in geographic work. The essential purpose is to present the existing situation, with little opportunity for interpretation or causal explanation. The significance of particular features is determined by the specific use for which the reports are prepared; whether for strategic military planning (as in the case of the largest body of work), specific military operations, military government, or planning of political policy.

In general this work was characterized as similar to that of textbook preparation: the assembly and digestion of a great amount of material from a large number of sources. It is, however, far more detailed and covers a much wider range of knowledge for any area than is possible in a textbook.

Further it is presented with a much larger number of photographs and maps than is generally possible in geographic publications.

Work of this type has been carried on by geographers in a number of different agencies. In the single most important case, the preparation of the Joint Army and Navy Intelligence Studies (known as JANIS), different sections of each regional report are prepared in different agencies and brought together and edited by the Joint Intelligence Publications Board. These studies have during the past year set a new standard in regional surveys for military purposes. Of the total volume of work involved, geographers contribute well over half. Their studies in physical geography, transportation, and urban analysis have attained considerable reputation.

Sections on social and political aspects are commonly prepared by men trained in other fields. In certain cases, material on terrain and water supply is prepared by a group of geologists. Sections on climate and on ports may be prepared by meteorologists or engineers who have had no training in geography.

In general, however, the standard outlines for this type of survey have been largely developed in Washington by geographers, and geographers are largely responsible for the supervision and final editing of the work.

2. *Intelligence cartography.* In part in connection with the preparation of regional surveys described above, and in part independent of such surveys, geographers have made notable contributions in the preparation of intelligence maps—i.e., the depiction of regional, as distinct from topographic, information on maps. This work is entirely separate from the normal survey mapping of government agencies, or the reproduction of foreign topographic maps, which is largely the work of non-geographers. It has resulted in the development of a type of cartography hitherto essentially unknown in the government. Further, it has not only utilized cartographic techniques previously familiar in academic geography, but has developed entirely new techniques of presentation and also of reproduction. It is particularly in this cartographic field that the work of geographers has been highly appreciated by other social scientists and by the military.

3. *Topographic models.* Under the supervision of trained geographers, detailed topographic models, on a regional scale, have been produced with a far greater degree of fidelity to physiographic reality than has even been done in this country before. In this work, likewise, new techniques have been developed that greatly reduce the labor required and increase the accuracy.

4. *Aerial photographic intelligence.* A number of geographers, unfortunately few, were able to make contributions in the development of this technique for detailed areal analysis.

5. *Map intelligence.* Coordinated research by teams of social scientists

was handicapped by the lack of training in the use, interpretation, evaluation, and knowledge of the existence of published maps. A procurement and recommendation service to assure the availability and use of maps was established by geographers in February 1942.

Later this service developed an organized program preparing written evaluations and interpretations of specific problems concerning published maps.

Geographers are now making available upon request map evaluation reports on all maps pertinent to specific international discussions in which the United States is a participant. The studies are an attempt to fill the existing gap in academic training of all American social scientists. A similar service has been planned for the United Nations. Secondary reports dealing with the methods, history and development of foreign mapping concerns are also prepared.

6. *Place names.* The great need for detailed information about foreign areas all over the world has greatly increased the need for consistency in the spelling of place names on maps used in planning and operations. The problem is particularly critical in the Far East and other areas where the local languages do not use the Latin alphabet. In the increased work of the Board on Geographical Names, geographers have played a major role.

7. *Miscellaneous and administrative work.* Trained geographers are employed in a number of agencies in research not primarily geographic in character, but in which the geographer's training in synthesis of the wide variety of factors that enter into actual problems may well constitute a particular advantage. It has also been suggested that this overall training of the geographer may in part explain the fact that a considerable number of geographers are being utilized in administrative positions in research agencies.

8. Subjects in which non-geographers are doing work that geographers might be expected to do.

a. General. Nearly all of the agencies employing geographers have found it necessary, because of the shortage of trained geographers, to employ men trained in other fields to work with geographers. Many of these have proven successful and no doubt have acquired thereby considerable geographic training. In particular, the profession was unable to supply an adequate number of specialists on Europe and the Far East.

b. Terrain and water supply. A considerable amount of work on these subjects is being carried on independently by men trained in geology and soil science. It is doubtful if there are enough geographers in Washington available to do the work that this group is competent to do.

c. Climate. Certain reports in this field are prepared by non-geographers, primarily because of the lack of geographers in certain branches of the armed forces, notably in the Navy. It is reported that this work suffers from lack of geographic approach.

d. Port facilities. Much the same is true in this case as in (c).

e. Commodity studies: production, consumption, and trade by countries. Most of the work in this field, in which geographers played a major role in the last war, is being carried on by economists.

9. *Major policy level.* With few exceptions, geographers have not played a major role, comparable to that of economists and others.

10. *Cooperative work.* Although geographers working in different agencies were not free of interdepartmental jealousies and back-biting that are all too familiar in governmental research agencies, on the whole they were more successful than most other workers in utilizing their professional associations to develop cooperation among agencies concerned with common research problems. Geographers both at the working level and in administrative positions, were largely responsible for the successful cooperation of a group of agencies in the preparation of the JANIS volumes previously referred to.

Geographers were also particularly successful in establishing excellent working relationships with men of other professions and in developing appreciation of the techniques of other fields.

11. *Extent of participation.* Geographers made significant contributions, recognized as the work of professional geographers, in almost all of the agencies, both old and new, whose research involved geographic study of foreign areas. Approximately two hundred professional geographers were employed in such research in Washington.

B. FUTURE OPPORTUNITIES FOR RESEARCH IN GEOGRAPHY

1. *Government.* It is still too early to determine the specific opportunities for geographic research in the federal government after the war (and the picture is hardly clearer in 1946). However, the development during the war indicates that there will be a demand for geographic work in foreign intelligence similar to that which has been carried on in several agencies concerned with foreign areas, notably those in the Far East and the USSR. It is possible that one or more such agencies will wish to develop reciprocal relations with universities, permitting the temporary transfer of personnel from time to time. One or more agencies may develop the use of geographers in the field, in foreign areas. In the domestic field, there was believed to be room for expansion of use of geographers in Agriculture and in Commerce.

Most of the Washington members of the group emphasized that few agencies will be interested in "geography" as such. The problems with which they are concerned are military, political, and economic; they are not concerned with "geographic problems." Consequently one should not look for development of "Geography Divisions," but rather for the utilization of men trained in geography. A number of agencies have learned what geographers are able to accomplish and will be ready to use such men, working with those of other disciplines. Any attempt to argue that a particular subject, such as the economy of an area was essentially "regional geography" and therefore should be handled solely by geographers would only invite a conflict from which the geographers could expect to emerge the losers. The essential tactic is to demonstrate the need for the cooperation of geographers in such work.

Governmental research will continue to be essentially team research in which men of varied training will be expected to work together on specific problems. Geographers who are to engage in such research must be prepared to work in close cooperation with men trained in other fields, without concern as to which individual is in charge.

In addition to the fields in which geographers have been contributing it was suggested that there was opportunity for significant development in the geography of nutrition and the geography of disease.

The following is suggested as an outline of governmental fields in which there should be opportunities for geographic research:

a. Federal government:
   (1) Land use—involving land productivity for alternative uses, multiple use, selection of best land for a particular use, land inventories and analyses of land programs
   (2) Reclamation—not only irrigation, but all phases of increasing the productive capacity of lands
   (3) Resource use and production—use of waters, forests, grass minerals, and fish
   (4) Analysis of regional economies and effects of programs on them
   (5) Regional delimitation and trade areas
   (6) Applied climatology
   (7) Intelligence work on foreign areas—military, political and commercial
   (8) Map intelligence—including collection and maintenance of fully indexed and annotated map libraries
   (9) Cartography
   (10) Aerial Photographic Intelligence
   (11) Geographic names
   (12) Public Health

(13) Recreation—educational work, research and park administration
(14) Population—application of Census data
(15) Urban studies
(16) Ports and ocean trade
(17) Legislation analysis and counselling

b. State governments:
(1) Land and resource inventories, similar to a(1–3), above
(2) Tax programs—involving questions of tax delinquency and equalization, effects of tax programs on economies, and school district reorganization
(3) Community needs and planning
(4) Legislation analysis and counselling

c. City government:
(1) Urban research and planning
(2) Promotion and public relations

2. *Business.* It was agreed that there is as yet too little experience in geographic research for business organizations to permit of definite conclusions. In view of the fact that American business will undoubtedly have increased concern in foreign areas there would appear to be a clear opportunity for contributions by geographers. Further, the field of domestic business has barely been touched. In particular, such new developments as aviation may offer a definite field of geographic research.

Specifically it was suggested that geographers would interest a business organization:

(1) If a geographer had already done a piece of work, whether in the form of a thesis or a publication and in the subject matter in which the business would be directly interested, or
(2) If the geographer was prepared to address himself directly to the problems facing a particular business, irrespective of whether these problems were exclusively geographic in character or not.

To train students for geographic research in business, a department might ascertain from a business organization the specific problems that concerned it and then assign a student work on a particular problem—if possible in cooperation with the business organization.

A professional geographer should be able to serve business either as the employee of a particular enterprise, analyzing its overall competitive position or its specific position in relation to source materials or markets or as the employee of a regional group of enterprises analyzing the competitive position of the area, its capacity to produce and consume, suggesting possible development programs. The types of enterprises that might be expected to recognize the value of such services would include:

(1) Banking and finance—particularly large organizations with widespread investments in bonds of governmental units and industries, both domestic and foreign
(2) Marketing organizations or market research branches of individual firms
(3) Transportation agencies—air, rail, water and truck
(4) Commercial cartography
(5) Organizations of the recreation industry
(6) Chambers of Commerce

Problems of industrial location and industrial integration require geographic analysis. Large enterprises, or trade associations of particular types of enterprises might well employ the services of professional geographers to work on those problems, notably in the following fields:

(1) Petroleum and its products
(2) Iron and steel industries
(3) The chemical industry
(4) The meat packing industry
(5) Publishing
(6) Moving picture industry

3. *Journalism.* It was urged that there is an opportunity, as yet little developed, for geographers in journalism. The war has brought an increased interest in millions of homes in the character of foreign lands; at the same time, continued emphasis on regional, state and city planning has developed a reader interest in non-technical, but sound analyses of domestic areas. In one metropolitan area this interest is being served by newspaper articles describing the various neighborhood entities composing the area that are based on the more thorough geographic research required for urban planning. Development of reader interest in this popular manner might well lead to more general recognition on the part of the public of the value of geographic research.

In general, opportunities for research outside the universities will be opportunities for applied research. That may require high skill in making a clear-cut analysis of a complicated situation and careful synthesis of the problem; geographers will properly endeavor to provide the analysis and synthesis. In many cases, however, the geographers will be expected, at the start at least, to serve primarily as "hewers of facts and drawers of maps." One is not to be discouraged by this attitude. These are contributions highly valued in applied research; young geographers who have demonstrated their ability to serve research organizations of government or business in this way will have opportunity at the same time to learn the needs of their organization and determine the possible applications of the

geographer's equipment and abilities to those needs. In most cases, what geography can provide can be demonstrated only by accomplishments, not by theoretical argument.

4. *University research.* The group felt that these were definite trends discernible in university research, influenced particularly by outside foundations but also by administrations, and that one should anticipate the following.

a. Great emphasis will be placed on research that has direct bearing on the solution of problems of the community, state and nation.

b. There is an increasing tendency to organize programs of research involving the work of several people in a department. Graduate students and junior instructors may be encouraged to carry out research that fits into a larger program, as distinct from purely individual research.

c. The complexity of problems in the social sciences makes it desirable to organize research involving men of different departments in the same institution. Geographers should be prepared both
   (1) To participate in a service capacity to various kinds of large research programs.
   (2) In certain fields of research, to take active leadership.

d. As a result, it is expected that graduate students will spend more time in team research and less time in course work. A system of organized research does not need to result in the eclipse of individual imagination and initiative. Rather it presents for each project a framework within which there should be full scope for utilization of such capacities. Particularly at the graduate level, and in the early post-doctoral years such limitation of the scope of work provides a better opportunity for sound development of these abilities because the more limited scope and more definite focus prevents dissipation of energy and encouragement of superficial work.

   The framework, however, should always be elastic—any member of a group working on a joint project, regardless of rank should be free to make his contribution to the planning of the project, subject only to the final determination by the group or its leader. The "thinking level" must include all professional workers on the project.

e. There are definite indications of a development of specialization by areas at different universities. Certain universities will give special emphasis to particular areas of the world and expect members of different departments to work together on those areas. In this case, it will be necessary to shift graduate students readily from one university to another in order that they can participate in the program

in which they are most interested. It would follow from this that any one department of geography should not attempt to cover the entire range of regional courses, whereas thorough graduate training would still make it necessary to cover the complete gamut of topical, or systematic, subjects.

In view of the vast number of possible lines of work, it would be highly desirable to concentrate the available personnel, as much as possible, on lines of maximum research value. One measure, if not perhaps the most critical, of value in research is that of the contribution it may make to social welfare. More and more it will be incumbent upon science to discharge its obligations to society by working on the problems that plague society.

f. There is a growing interest in work at the university level, both research and teaching, on the problems of geography in the elementary and secondary schools. In comparison with many other fields—for example history, mathematics, and the foreign languages—university departments of geography have taken relatively little part in the consideration of curriculum programs for the high schools, in analyses of the effectiveness of use of different types of maps, globes, and textual materials at different school levels, etc. Such questions have been left either to the teachers colleges, where there may be little time for research into the problems, or to the colleges of education which with few exceptions have no personnel adequately trained in geography.

Here is a major opportunity for professional geographers who can combine sound training in geography with training and experience in education. Whether such individuals should be included in the academic departments of geography or in the schools of education is of minor importance provided they have the full intellectual support and cooperation of both.

g. Finally, it was noted that the increased interest in geography in the United States is being reflected in smaller colleges as well as universities. Quite possibly there may be greater increase in professional opportunities for research, as well as teaching, in those institutions than in the larger universities with well-established departments of geography.

Students should not be given the feeling that only large university departments have worthwhile opportunities. The opportunities for research in small colleges and in applied geography should be emphasized.

C. TRAINING—LESSONS LEARNED FROM THE WAR EXPERIENCE

In the previous discussion of geographic work for the government during the war, various deficiencies were noted in the previous training of professional geographers that handicapped their ability to carry on their work with maximum success. The later discussion of these deficiencies led to the following suggestions concerning training of professional geographers.

1. *Ability in foreign languages.* Professional geographers were found to be weak in ability to use source materials in foreign languages. While ability in the spoken language is important in field work, interviewing and in work on place names, the major need is ability to utilize publications in the foreign language. The geographer specializing in any region should be expected to command the language, or major languages, of that region.

Adequate training is not secured by requiring the student to take language courses and pass a language test; the essential need is training in the use of the foreign language material in research. Graduate courses in geography, particularly research seminars, should require the student to use foreign language material so that he becomes accustomed to regarding use of such material as an essential part of his work in geography. The responsibility therefore is not one that can be shifted to the foreign language departments, but remains with the geography department.

There is very great particular need in the profession for men able to handle such languages as Russian or Chinese that are essential in geographic research for major areas of the world but are seldom learned by American students. Several members of the Committee supported the suggestion that graduate schools might be urged to lend encouragement to graduate student workers to concentrate on attaining genuine competence in such language by waiving, in such cases, the normal requirement for a second foreign language.

2. *Development of the ability to sense the problem.* Representatives of all agencies reported as a major deficiency—though not peculiar to geographers—lack of sense of problem. The problem should be conceived as a question the answer to which seems worth finding out. In academic research, the question refers to a gap in our geographical knowledge or techniques, a gap which we strive to fill. In applied research, it refers to human needs, a problem as the word is used by the layman.

In the latter case, we have the advantage of specific basis for determining the problem. What is the need, what is unknown that if known would satisfy or materially aid that need? All other elements are subordinate and if unrelated must be eliminated. In the former, academic, case in which the problem is based on intellectual curiosity, the process of thinking is different. What is the unknown that is to be made known? What will be the signifi-

cance of this knowledge, when attained, to geographic knowledge in general? Will it fill a major gap in our knowledge, or if a small one in itself, will it provide a key that can be used to secure major gains?

It has been argued that "sense of problem" is an innate gift and the responsibility of a graduate department was simply to test the student to determine whether or not he had it. But experience in war research has shown that many who appeared deficient in this respect did profit from the training they received in organized research.

Graduate training, therefore, should include a greater number of experiences in the formulation of research problems that are then subjected to critical review. Such experiences are likely to be particularly valuable if the projects are directed toward readers outside the profession of geography.

It was also suggested that there was lacking a set of definite principles of criticism on this subject; a statement of such principles would be helpful to teachers as well as students. In any case, directors of research in the academy should be no less critical of poorly defined problems than are those in organizations concerned with applied research.

One specific aspect of this general difficulty is of particular significance in geography. The contribution of geography is necessarily in large part descriptive and in the descriptive study of a region, or of any systematic topic in the region, it is not obvious what the problem is. In the presentation of detailed regional surveys, many men with geographic training, as well as those who had had none, could only provide an elementary detailed description of pattern. Not realizing that the first problem in geography is the recognition of regional differences, they were unable to write a terse characterization of the particular topic in the region under study, in comparison with the same topic in other known regions.

Such characterizations may or may not require a regional break-down of the area under study. If relatively homogeneous, it can be characterized as a whole. If notably heterogeneous, averages for the whole may mean little; each notably different part must be characterized separately.

3. *Development of sense of relevance.* Closely related to the previous deficiency was the tendency of many workers to include in their report on any topic all the information secured that seemed in any way related to it, without regard to its relevance to the problem concerned. While this is inevitable if the problem itself is not formulated and clearly perceived, even when that has been done, many workers prepared reports heavily overloaded with unnecessary material.

It is necessary to convince students that the purpose of a research report is not to demonstrate how much the student has learned about the subject—presumably he has needed to learn far more than should appear in

this report—but only to find and demonstrate the answer to the question posed by the study.

The necessary training can most easily be given by frequent assignment of relatively short research problems the reports of which may be returned to the student with specific editing of irrelevant material.

4. *Training in reader-consciousness.* Training in research writing in university departments is done by having students write papers or theses for teachers who are committed to reading them and whose superior knowledge of the subject makes it easy to understand what is written if it is only up to the minimum standards of intelligible prose. To a considerable extent, the same is true of articles published in our professional journals.

Experience outside the university was a sharp reminder that under this system two fundamental questions in any writing are easily overlooked. Assuming the report actually gets to the consumers who need it or whom the writer wishes to read it and that those persons do look at it, (1) will they actually read the report, or its essential part, and (2) will they be able to understand what they read. If the answer in either case is in the negative, the report is a complete failure. Any question of the responsibility of the readers is irrevelant.

Putting the matter in the positive, a report, article, or book, to accomplish its purpose, must be prepared in form and character suitable to the consumers for whom it was prepared. If professional geographers are to be ready to put their knowledge to any form of applied research they must be trained to prepare reports that are understandable to readers not conversant with our technical terms and, above all, to recognize that the reader is commonly a person rushed for time and concerned primarily with the conclusions presented him. If these are hidden in the text of a long report, he will very likely stop reading before he gets to them.

Inclusion of irrelevant material is not to be regarded as an addition to the report, but rather as a deterrent, blocking the progress toward the essential results and very likely convincing the reader that he has not time to go further.

Special emphasis needs to be laid on training in the careful preparation of the summary of a report, not as an afterthought, but as the essential part of the report, for which the full body of the report may be merely the demonstration.

5. *Training in judgment of the scale appropriate to the problem and the degree of precision required.* It is an essential part of the business of geography to locate phenomena on the earth—to put it on a map; further, our intellectual curiosity is most completely satisfied if we map the subject in most complete detail. Consequently there is a tendency, noted by several reporters, for geographers to study and map the phenomena studied in what-

ever degree of detail the source material and time permits, without reference to the purpose of the study.

For some purposes it may be all important to map a single square mile in full detail; in other studies there may be no justification for detail within a region. For example, a study designed to estimate the effects of assigning the Saar industrial district in toto to France would not require the detailed mapping of mines and industries in the Saar that would be needed if there were question of dividing the area. On other cases, the scale needed is so small that a map is hardly necessary, for example, a study of the potential manpower of the major powers.

Students should be trained to keep clearly in mind the scale of framework in which they are working on a particular problem: whether topographic, regional, nation-wide, or world.

6. *Training in precision standards.* Whatever the scale of study, quantitative measurement and accurate description by the correct use of scientific terminology are essential hallmarks of science too often overlooked in geographic research. Constant criticism should be directed at the use of common adjectives that give the appearance of measurement or description but do not in fact convey a definite picture from the writer to the reader. In particular, professional geographers in the future will require much more grounding in statistics than has been true in the past.

7. *Training in allied fields, notably in the social sciences.* Geography is a field that inevitably overlaps into nearly all the natural and social sciences. It was urged that every graduate student should be thoroughly trained in an allied field of study in addition to this specific training in geography and the techniques of geography.

Most professional geographers in America have had more training in the natural sciences than in the social sciences but the problems on which professional geographers are called upon to apply their knowledge are more often social problems. They are therefore called upon to work in cooperation with workers trained in other social sciences. The experience in Washington indicates that too many geographers were found to be naive or superficial in their approach to economic and political problems on which they had to contribute. This not merely diminished the value of their work, but in many cases created an attitude on the part of their colleagues in those fields that prevented the geographers making the contribution they could in fact have made.

In this connection it was noticed that in the relation of geography to the natural sciences, geography is more often in the position of recipient—the geographers need information from those fields whereas workers in many aspects of physics, chemistry, biology and even geology may have little need of geography. On the other hand, a wide range of social problems require

geographic treatment in order to arrive at sound results; the social scientist therefore has more need of geography, even though he may not be aware of the fact. He is less likely to be convinced of this however if the geographer available to help him has little understanding of the principles or techniques of history, economics or political science.

Furthermore, geographers, including most of those in academic life, are repeatedly impelled in their studies of any area to examine and report on the human or social problems of the area. Even among those geographers who are primarily concerned with physical geography, there is hardly one in America today who has not published studies on the social side of geography. Even though the material needed by the geographer is not supplied in course instruction in the allied social fields, the value of his studies of such problems will be questionable if he has only a superficial understanding of the social science involved.

Training to overcome this deficiency, which was recognized long before the war but was shown to be particularly serious in war-work, requires more than the satisfactory completion of elementary courses in the other social sciences. It should be part of the graduate training of the professional geographer, integrated in his geographic training. Three specific methods are suggested:

(1) Requesting teachers in allied departments to review critically research papers in geography that overlap into their fields;
(2) inviting instructors in allied departments to take part in seminars in geography or, perhaps better, arranging for cooperative seminars that will include students as well as teachers from more than one department, and most effective of all,
(3) arranging for cooperative research work by students from allied departments.

Graduate students in geography may learn more from close and continuous working contacts with graduate students of other departments than from occasional contacts with instructors because of the greater assurance of full criticism freely given in the process of the work.

8. *Training in cooperative research.* Practically all professional geographers who take positions in research outside the universities will be plunged at once into cooperative or group research and their success in their position will depend on their ability to function in that way, regardless of any ability to work as individualists. It may well be also that much the same will be increasingly true in university research. Yet our training programs provide little or no experience in cooperation on research, practically none in team research—in which a group is definitely organized, each member assigned to particular parts of the full job.

To provide for such training will require major changes in graduate work. This can begin within a geography department, by the assignment of specific problems each to be worked out by a small group of students organized as a team, with a team leader.

Projects might be set up to which each graduate student would have to make definite contributions week by week; thus developing the habit of contribution to joint objectives and getting criticism on small pieces of work. The organization of students into teams for such projects would bring out latent capacities for leadership, particularly in producing research having practical results. The system will be much more profitable, as suggested above, if departments can cooperate so that the team of students will include members from allied fields.

9. *Training for regional specialization.* The war-time experience raises critical questions concerning the emphasis in recent decades on graduate training in regional geography. (Edward Ackerman has discussed this question more fully in "Geographic Training, Wartime Research, and Immediate Professional Objectives," *Annals Assoc. Amer. Geog.,* 35 (1945): 121–143.

Most applied geographic research is research on the problems of particular regions; this was most certainly the case of war-time geographic research. There was a great and constant demand for men who were thoroughly competent in the geography of particular foreign countries. The profession was far less able to meet this demand than it was to supply competent technicians. The test was most clear in the case of one agency, employing the largest number of geographers in Washington, which had been organized primarily on a regional basis and from the beginning sought regional specialists in all the social sciences. By the end of the war, of its total number of some 75 geographers, two had a considerable special competence on the Soviet Union and one of the two had travelled there; one had worked fairly intensively in two or three countries of Central Europe, two had studied intensively in parts of the Far East, one in each of two countries; three were specialists of standing on certain countries of Latin America. Of the remainder, a few had attained considerable specialization on certain regions of the United States, but the great majority could not claim any notable degree of specialization on any major regions.

Of the total of eight more or less genuine regional specialists, during the major part of the time, only two were employed, each about half-time in research work on the area of his specialty. The Latin American specialists were found to be more needed to work on European problems, and since the group included most of the more mature men, they were called upon to work in the administration of research, several of them exclusively.

Nevertheless effective regional work was carried on. By the end of the period, many men who had not previously specialized on the region in which they were put to work had acquired far more detailed knowledge of some parts of that region than the geographers who were previously rated as the regional specialists. The experience indicated that men who had been thoroughly trained in the systematic branches of geography and in its techniques, and had likewise been trained in the methods of synthesis in regional geography in general, were able—subject primarily to special language problems—to apply their training effectively to any region new to them.

It is true that such newly developed regional specialists could not attain that command of all the problems of a country that is needed for final analysis and recommendations at the level of ultimate synthesis of geographic, economic, social, and political factors. Work of this character, however, constituted a minor part of the total research, not necessarily the most important part.

The explanation for this situation is not far to seek. Graduate training of three or four years for the doctorate, no matter how planned, cannot produce well-trained geographers who are also specialists on any large region or country. That requires at least four or five years more of specialized study and, in the case of foreign countries, of extended field work for which few geographers will have sufficient opportunity in a lifetime. But it will almost inevitably be true, as it was true in this experience, that major efforts in applied geographic research, will require the utilization of large numbers of relatively young workers.

The committee therefore drew the following conclusions:

(1) Graduate training cannot hope, and therefore should not pretend, to produce regional specialists, but rather to train men so that they will have the ability and the incentive to become regional specialists later.

(2) A regional course on a continent, even with the addition of an advanced course on part of that continent, can provide the student with information that is not only entirely inadequate for genuine regional specialization but also is not necessary for the student who intends to become a specialist on that region. A well-trained student can secure that information by independent study.

(3) An essential part of the training for geographic research is training in the methods of regional geography in general. This can best be taught by demonstration, in which the instructor utilizes the regions of his own specialization for his material. So far as graduate training is concerned, therefore, each instructor would give regional work on not more than one, possibly two, major regions.

(4) Since methods in regional geography are not standardized, and probably cannot be, a student can acquire additional training of value in taking regional courses with more than one specialist, but presumably not by taking several regional courses from the same instructor.

(5) There is no need, in training for research, for a student to take regional courses covering the world. Training in systematic geography will have provided him with the general framework of world regional geography; at any time that he needs informational content on any region, he should be capable of securing it himself.

(6) Insofar as the graduate student can determine the area of the world on which he will later specialize, he should be urged to secure the necessary linguistic competence for working in that area.

10. *Training in the systematic branches of geography.* Because most applied geographic research is concerned with regions or localities, the research student most emphatically needs thorough grounding in all the systematic branches of geography. For while it is difficult to predict what region of the world he may be called upon to study, it is safe to predict that in analyzing all the different kinds of phenomena found together in an area, he will need the best possible training in the systematic divisions of the field. Neither the content nor the techniques of one of these fields are transferrable to the others.

Of the various systematic branches, weakness was noted particularly in the study of vegetation—in the sense of actual vegetative cover. Most workers found difficulty in using the botanical sources. Whether training in this field can best be secured from a department of botany will depend on the particular conditions at different universities; the need of the geographer is the study of plant associations as actually found in an area, rather than in the geography of individual plants.

11. *Training in the special techniques of geography.*

A. Air photo analysis. Work in this field has proceeded faster outside the universities than within, thanks to the greater resources of military and other governmental agencies and to the pressing needs of the moment. It is essential that university departments secure the necessary equipment and competence to carry on this form of training.

B. Field work and interviewing. Although most of the work during the war period did not permit of field experience, several reporters noted that the work of professional geographers in their agencies suffered because of lack of adequate training in this aspect of geographic work, notably lack of experience in foreign countries.

C. Cartography. Knowledge of the mathematics of map projections and map projections and ability to handle personally all construction techniques are not the essential requirements in cartography for professional geographers. The following were found to be more fundamental and generally lacking among trained geographers: (1) Ability, before construction, to "compose" or "outline" a map for a specific purpose and relate all components to the purpose and to one another; (2) Principles of design and presentation; (3) Familiarity with the limitations and possibilities of different methods of construction and reproduction and the relationship between the two operations; (4) Familiarity with the critical judgment of the available map sources; (5) Familiarity with simple mathematical and statistical techniques and tools.

Training of the graduate students should include not only course work covering the above aspects, but also continued criticism and guidance in preparation of maps for research reports along the lines indicated.

D. Map intelligence. Knowledge of the uses, interpretation, evaluation and availability of topographic and subject maps, are essential parts of the training of professional geographers. Prior to the war no academic institution in the United States offered such training to its graduate students. Such training would include: (1) Knowledge of the development of mapping and coverage of the great world surveys; (2) Evaluation of maps as to content and accuracy of presentation, especially in relation to subject maps; (3) Methods of presentation utilized by the standard mapping agencies of the world; (4) Interpretation of specific problems as presented through the use of maps; (5) Methods and techniques essential to the maintenance of a map library including cataloging, indexing, and filing; (6) Selection of maps required for the preparation of studies, with respect to scale of map in relation to material presented, special techniques used in the preparation of selected maps and resulting reliability.

12. *Training in understanding of the nature of geographic work.* In a field that is so apt to include persons with diverse backgrounds, in which workers are engaged in a wide diversity of research, there is need to develop an understanding of the essential unity of the subject and a sense of belonging to a long-established discipline. For these purposes, graduate work in geography should include the study of the historical development of geographic thought.